State of Utah
DEPARTMENT OF NATURAL RESOURCES

Proposed Utah Species of Concern List

Revised

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1. Introduction

Pursuant to Utah Department of Natural Resources Administrative Rule R657-48, the Utah Division of Wildlife Resources (UDWR) has prepared the following proposed Species of Concern List for review by the Wildlife Species of Concern and Habitat Designation Advisory Committee (Committee). The Species of Concern List is to be considered by the Committee for inclusion of these species on a newly revised Utah Sensitive Species List. By rule, species that are federally listed, candidates for federal listing, or for which a conservation agreement is in place automatically qualify for the new Utah Sensitive Species List.

The proposed Species of Concern List (List) identifies wildlife species for which there is credible scientific evidence to substantiate a threat to continued population viability. It is anticipated that inclusion on the List will identify species for which conservation actions are needed, and that timely and appropriate conservation actions implemented on their behalf will preclude the need to list these species under the provisions of the federal Endangered Species Act.

The List was developed by teams of UDWR employees with expertise in Utah species and habitats, aquatic ecology, terrestrial ecology, population genetics, conservation biology, and native species management. Some of the team members participate in relevant recovery and conservation program technical committees and recovery teams.

Team members endeavored to make the List objective. To this end, the teams developed scientifically sound criteria to be used in the evaluation of species for inclusion on the List. These criteria were numerous, but fell into four categories: biology and life history, population, distribution, and threats. These four categories of criteria are presented in **Table 1**, along with some example criteria in each category.

Table 1. Four categories of evaluation criteria for the Utah Species of Concern List

Biology/Life History	Population	Distribution	Threats
1. Fecundity/ Vulnerability due to non-native species 2. Genetic uniqueness 3. Portion of life history only in Utah	1. Declining population trends 2. Number of extant populations 3. Population viability	1. Limited distribution 2. Changed distribution 3. Connectivity of populations 4. Endemic to Utah	1. Habitat loss 2. Habitat degradation 3. Population fragmentation 4. Habitat fragmentation 5. Disease 6. Predation 7. Hybridization 8. Competition 9. Over-utilization

The proposed Species of Concern List was developed using the best information available and the above criteria. As a first step, standardized data compiled by UDWR's Utah Natural Heritage Program were used to determine the wildlife species with possible threats to continued population viability. Natural Heritage Program methodology is used in much of the Western Hemisphere by government agencies and other organizations to objectively determine the relative viability of species.

After the wildlife species vulnerable to extinction or extirpation were identified, the teams assembled additional data and literature in order to fully evaluate these species for possible inclusion on the List. Each species was considered individually using the collective knowledge of the experts on the teams, as well as the data and literature at their disposal. Important sources of information included published literature, agency reports, and data collected by UDWR, cooperating agencies, and other groups. The List developed is the result of analysis by professionally educated, informed individuals carefully weighing the relative threats to Utah's wildlife species.

The proposed Species of Concern List is supported by individual species accounts that apply the evaluation criteria to each species of concern and include relevant citations. The species account format follows R657-48-7(3). The List and associated species accounts follow.

2. The Utah Sensitive Species List

2.1 Utah's Federally Listed and Candidate Species

The following tables show the federally listed species, including threatened, endangered, and candidate species, that exist within the state of Utah. Definitions of these terms are provided in **Table 5.**

Table 2. Federally threatened species within the state of Utah

Common Name	Scientific Name	Status
Fishes:		
Lahontan cutthroat trout (introduced)	*Oncorhynchus clarki henshawi*	T
Amphibians:		
(None)		
Reptiles:		
Desert tortoise	*Gopherus agassizii*	T
Birds:		
Bald Eagle	*Haliaeetus leucocephalus*	T
Mexican Spotted Owl	*Strix occidentalis lucida*	T
Mammals:		
Utah prairie-dog	*Cynomys parvidens*	T
Gray wolf (north of I-70/Route 50)	*Canis lupus*	T Extirpated
Brown (grizzly) bear	*Ursus arctos*	T Extirpated
Canada lynx	*Lynx canadensis*	T
Mollusks:		
(None)		

Table 3. Federally endangered species within the state of Utah

Common Name	Scientific Name	Status
Fishes:		
Humpback chub	*Gila cypha*	E
Bonytail	*Gila elegans*	E
Virgin River chub	*Gila seminuda*	E
Colorado pikeminnow	*Ptychocheilus lucius*	E
Woundfin	*Plagopterus argentissimus*	E
June sucker	*Chasmistes liorus*	E
Razorback sucker	*Xyrauchen texanus*	E
Amphibians:		
(None)		
Reptiles:		
(None)		
Birds:		
California Condor	*Gymnogyps californianus*	E Experimental
Whooping Crane	*Grus americana*	E Extirpated
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E

Mammals:		
Black-footed Ferret	*Mustela nigripes*	E Experimental
Gray wolf (south of I-70/Route 50)	*Canis lupus*	E Extirpated
Mollusks:		
Kanab ambersnail	*Oxyloma kanabense**	E
Desert valvata**	*Valvata utahensis*	E Extirpated

*The U.S. Fish and Wildlife Service refers to this species as "*Oxyloma haydeni kanabensis*." For consistency, the nomenclature of Turgeon et al. (1998) is followed here.

**The U.S. Fish and Wildlife Service refers to this species as "Utah valvata snail" (Williams 2002). For consistency, the nomenclature of Turgeon et al. (1998) is followed here.

Table 4. Federal candidate species within the state of Utah

Common Name	Scientific Name	Status
Fishes:		
(None)		
Amphibians:		
Relict leopard frog	*Rana onca*	C Extirpated
Reptiles:		
(None)		
Birds:		
Gunnison Sage-grouse	*Centrocercus minimus*	C
Yellow-billed Cuckoo	*Coccyzus americanus*	C
Mammals:		
(None)		
Mollusks:		
Ogden Rocky mountainsnail	*Oreohelix peripherica wasatchensis*	C
Fat-whorled pondsnail	*Stagnicola bonnevillensis*	C

Table 5. Definitions of status terms used in tables 2, 3, and 4

E	A taxon that is listed by the U.S. Fish and Wildlife Service as "endangered" with the possibility of worldwide extinction.
E Experimental	An "endangered" taxon that is considered by the U.S. Fish and Wildlife Service to be "experimental and non-essential" in its designated areas in Utah.
E Extirpated	An "endangered" taxon that is "extirpated" and considered by the U.S. Fish and Wildlife Service to no longer occur in Utah.
T	A taxon that is listed by the U.S. Fish and Wildlife Service as "threatened" with becoming endangered.
T Extirpated	A "threatened" taxon that is "extirpated" and considered by the U.S. Fish and Wildlife Service to no longer occur in Utah.
C	A taxon for which the U.S. Fish and Wildlife Service has on file sufficient information on biological vulnerability and threats to justify it being a "candidate" for listing as endangered or threatened.

C Extirpated	A “candidate” taxon that is “extirpated” and no longer occurs in Utah.

2.2 Utah’s Conservation Agreement Species

The following are species within the state of Utah that have active conservation agreements. Multi-agency groups meet periodically to discuss conservation goals and actions for the individual species.

Table 6. Utah’s conservation agreement species

Common Name	Scientific Name
Fishes:	
Bonneville cutthroat trout	*Oncorhynchus clarki utah*
Colorado River cutthroat trout	*Oncorhynchus clarki pleuriticus*
Virgin spinedace	*Lepidomeda mollispinis mollispinis*
Least chub	*Iotichthys phlegethontis*
Amphibians:	
Columbia spotted frog	*Rana luteiventris*
Reptiles:	
(None)	
Birds:	
Northern Goshawk	*Accipiter gentilis*
Mammals:	
(None)	
Mollusks:	
(None)	

2.3 Proposed Utah Species of Concern List

The proposed Utah Species of Concern List (**Table 7**) is organized by phylum and class.

Table 7. Proposed Utah Species of Concern List

I. Phylum: Chordata, Chordates

A. Class: Osteichthyes, Bony Fishes

	Scientific Name	Common Name
1.	*Gila copei*	leatherside chub
2.	*Gila robusta*	roundtail chub
3.	*Catostomus clarki*	desert sucker
4.	*Catostomus discobolus*	bluehead sucker
5.	*Catostomus latipinnis*	flannelmouth sucker
6.	*Oncorhynchus clarki bouvieri*	Yellowstone cutthroat trout
7.	*Prosopium abyssicola*	Bear Lake whitefish
8.	*Prosopium gemmifer*	Bonneville cisco
9.	*Prosopium spilonotus*	Bonneville whitefish
10.	*Cottus extensus*	Bear Lake sculpin

B. Class: Amphibia, Amphibians

	Scientific Name	Common Name
1.	*Bufo boreas*	western toad
2.	*Bufo microscaphus*	Arizona toad

C. Class: Reptilia, Reptiles

	Scientific Name	Common Name
1.	*Callisaurus draconoides*	zebra-tailed lizard
2.	*Coleonyx variegates*	western banded gecko
3.	*Dipsosaurus dorsalis*	desert iguana
4.	*Heloderma suspectum*	Gila monster
5.	*Sauromalus ater*	common chuckwalla
6.	*Xantusia vigilis*	desert night lizard
7.	*Crotalus cerastes*	sidewinder
8.	*Crotalus mitchellii*	speckled rattlesnake
9.	*Crotalus scutulatus*	Mojave rattlesnake
10.	*Elaphe guttata*	cornsnake
11.	*Opheodrys vernalis*	smooth greensnake
12.	*Leptotyphlops humilis*	western threadsnake

D. Class: Aves, Birds

	Scientific Name	Common Name
1.	*Ammodramus savannarum*	Grasshopper Sparrow
2.	*Asio flammeus*	Short-eared Owl
3.	*Athene cunicularia*	Burrowing Owl
4.	*Buteo regalis*	Ferruginous Hawk
5.	*Centrocercus urophasianus*	Greater Sage-grouse
6.	*Charadrius montanus*	Mountain Plover
7.	*Cypseloides niger*	Black Swift
8.	*Dolichonyx oryzivorus*	Bobolink
9.	*Falco peregrinus*	Peregrine Falcon
10.	*Melanerpes lewis*	Lewis's Woodpecker
11.	*Numenius americanus*	Long-billed Curlew
12.	*Pelecanus erythrorhynchos*	American White Pelican
13.	*Picoides tridactylus*	Three-toed Woodpecker
14.	*Tympanuchus phasianellus*	Sharp-tailed Grouse

E. Class: Mammalia, Mammals

	Scientific Name	Common Name
1.	*Sorex preblei*	Preble's shrew
2.	*Corynorhinus townsendii*	Townsend's big-eared bat
3.	*Euderma maculatum*	spotted bat
4.	*Idionycteris phyllotis*	Allen's big-eared bat
5.	*Lasiurus blossevillii*	western red bat
6.	*Myotis thysanodes*	fringed myotis
7.	*Nyctinomops macrotis*	big free-tailed bat
8.	*Brachylagus idahoensis*	pygmy rabbit
9.	*Cynomys gunnisoni*	Gunnison's prairie-dog
10.	*Cynomys leucurus*	white-tailed prairie-dog
11.	*Perognathus flavus*	silky pocket mouse
12.	*Microdipodops megacephalus*	dark kangaroo mouse
13.	*Microtus mexicanus*	Mexican vole
14.	*Vulpes macrotis*	kit fox

II. Phylum: Mollusca, Mollusks

A. Class: Gastropoda, Snails

	Scientific Name	Common Name
1.	*Ogaridiscus subrupicola*	southern tightcoil
2.	*Oreohelix eurekensis*	Eureka mountainsnail
3.	*Oreohelix haydeni*	lyrate mountainsnail
4.	*Oreohelix parawanensis*	Brian Head mountainsnail
5.	*Oreohelix peripherica*	Deseret mountainsnail
6.	*Oreohelix yavapai*	Yavapai mountainsnail
7.	*Physa megalochlamys*	cloaked physa
8.	*Physella utahensis*	Utah physa
9.	*Physella zionis*	wet-rock physa
10.	*Pyrgulopsis anguina*	longitudinal gland pyrg
11.	*Pyrgulopsis chamberlini*	smooth Glenwood pyrg
12.	*Pyrgulopsis deserta*	desert springsnail
13.	*Pyrgulopsis fusca*	Otter Creek pyrg
14.	*Pyrgulopsis hamlinensis*	Hamlin Valley pyrg
15.	*Pyrgulopsis inopinata*	carinate Glenwood pyrg
16.	*Pyrgulopsis nonaria*	Ninemile pyrg
17.	*Pyrgulopsis peculiaris*	bifid duct pyrg
18.	*Pyrgulopsis pilsbryana*	Bear Lake springsnail
19.	*Pyrgulopsis plicata*	Black Canyon pyrg
20.	*Pyrgulopsis saxatilis*	sub-globose Snake pyrg
21.	*Pyrgulopsis transversa*	southern Bonneville pyrg
22.	*Pyrgulopsis variegata*	northwest Bonneville pyrg

B. Class: Bivalvia, Mussels

1.	*Anodonta californiensis*	California floater
2.	*Margaritifera falcate*	western pearlshell

Table 8. Species extinct or extirpated from Utah

I. Phylum: Chordata, Chordates

A. Class: Osteichthyes, Bony Fishes

1.	*Cottus echinatus*	Utah Lake sculpin (extinct)

B. Class: Amphibia, Amphibians

1.	*Rana onca*	relict leopard frog (extirpated)

C. Class: Reptilia, Reptiles

(None)

D. Class: Aves, Birds

1.	*Ectopistes migratorius*	Passenger Pigeon (extinct)
2.	*Grus americana*	Whooping Crane (extirpated)

E. Class: Mammalia, Mammals

1.	*Canis lupus*	gray wolf (extirpated)
2.	*Ursus arctos*	brown (grizzly) bear (extirpated)
3.	*Martes pennanti*	fisher (extirpated)
4.	*Gulo gulo*	wolverine (possibly extirpated)

II. Phylum: Mollusca, Mollusks

A. Class: Gastropoda, Snails

1.	*Helisoma newberryi*	Great Basin rams-horn (extirpated)
2.	*Physella microstriata*	Fish Lake physa (extinct)
3.	*Stagnicola pilsbryi*	Fish Springs marshsnail (extinct)
4.	*Stagnicola utahensis*	thickshell pondsnail (extinct)
5.	*Valvata utahensis*	desert valvata (extirpated)

3. Class: Osteichthyes, Bony Fishes

3.1 *Gila copei,* leatherside chub

Species status statement. The leatherside chub is a member of the minnow family (Cyprinidae) that occurs in pools and low-velocity runs of creeks and small- to medium-sized rivers. Spawning takes place during summer months. Leatherside chubs attain a length of 152 mm and live up to five years (Sigler and Sigler 1996). Genetic analysis by Johnson and Jordan (2000) reported the leatherside chub to be two evolutionarily distinct lineages, one comprising northern populations within the Snake and Bear River drainages, and another comprising southern populations within the Utah Lake and Sevier River drainages. Dowling et al. (2002) found the leatherside chub of northern Utah and southern Idaho to be more closely related to the spinedace species of southern Utah and Arizona than to the leatherside chub of central Utah. The leatherside chub has not formally been divided into two species, but the separation appears, at this time, to be warranted and would have conservation implications. The number of extant populations, as well as the number of individuals within populations, have been declining (Wilson 1996, Wilson and Belk 1996, Wilson and Lentsch 1998, and Wilson and Belk 2001).

The leatherside chub is endemic to the Bonneville Basin and the upper Snake River drainages (Sigler and Sigler 1996, Johnson and Jordan 2000). The current distribution in Utah includes the northern populations located in the Snake and Bear River drainages (Nadolski and Thompson 2003), the southern populations in the Utah Lake and Sevier River drainages (Johnson and Jordan 2000; Dowling et al. 2002), and introduced populations in the Colorado River Basin. The illegal transport of live minnows as bait may explain the distribution of leatherside chub into areas outside its historic range. The leatherside chub is believed to be extirpated from the Beaver River system and reduced to 58 percent of its original range in the Sevier River system (Wilson 1996, Wilson and Belk 1996, Wilson and Belk 2001). Historically, the leatherside chub may have been found between the northern and southern populations in the Weber River and Salt Lake drainages (Johnson and Jordan 2000).

Connectivity of leatherside chub populations between streams and within drainages is limited (Dowling et al. 2002). There is no modern naturally occurring connectivity of fragmented leatherside chub populations between the Bonneville and Snake River basins, and

between the Sevier River, Utah Lake, and Bear River drainages within the Bonneville Basin. Drought, stream dewatering, reservoirs, and introduced predatory species have isolated populations within streams (Wilson and Belk 1996).

Statement of habitat needs and threats to the species. Small leatherside chubs prefer shallow, low-velocity areas, whereas larger individuals prefer deeper water with low velocities (Belk and Wilson 1996). Leatherside chubs prefer substrates dominated by coarse fines with lower percentages of sand-silt and gravel (Belk and Wilson 1996). Loss of habitat heterogeneity (i.e., low-velocity refugia within high-gradient streams) caused by erosion, removal of riparian vegetation and channelization creates unfavorable conditions for leatherside chubs. Other significant threats to leatherside chub populations are stream dewatering and stream barriers, which interrupt stream flow and isolate populations within stream reaches, causing population or metapopulation fragmentation (Belk and Wilson 1996). Predation by nonnative fish (particularly brown trout, *Salmo trutta*) is an additional factor threatening population viability (Walser et al.1999).

Anticipated costs and savings. Preventing leatherside chub from being listed under the ESA could reduce the need to mitigate water development and agricultural activities in the counties in which the fish occurs. Protection and enhancement of populations of leatherside chub should also allow continued nonnative sport fishing opportunities within the range of leatherside chub in Utah. Engaging in proactive conservation actions to protect leatherside chub populations decreases the likelihood and magnitude of mitigation costs to communities and the state.

Rationale for proposed designation. Range-wide leatherside chub habitat fragmentation, threats posed by nonnative predators, and the likelihood of division of the species into two species warrant listing leatherside chub a Species of Concern.

3.2 *Gila robusta*, roundtail chub

Species status statement. The roundtail chub is a relatively large member of the minnow family (Cyprinidae) found in major rivers and smaller tributary streams. Roundtail chub larvae and young-of-the-year use low velocity backwaters. Although movement patterns are poorly documented, the roundtail chub has been described as sedentary and mobile, depending on life

stage and habitat conditions (Bezzerides and Bestgen 2002). Roundtail chubs typically mature from ages three to five, and fecundity varies with fish from as low as 1,000 eggs to over 40,000 eggs per female.

Extant roundtail chub populations in Utah occur in the Escalante and San Rafael rivers; in portions of the middle and upper San Juan River and several tributaries; in the Colorado River from Moab to Silt, Colorado; in the Fremont River; in the Green River from the Colorado River Confluence upstream to Echo Park; in the White River from the Green River confluence upstream to near Meeker, Colorado (Bezzerides and Bestgen 2002); and in the Duchesne River from the Green River confluence upstream to Myton (Brunson 2001).

The roundtail chub now occupies approximately 45 percent of its historical range in the Colorado River Basin. In the Upper Colorado River basin (New Mexico, Colorado, Utah, and Wyoming), it has been extirpated from approximately 45 percent of its historical range, including the Price River (Cavalli 1999) and portions of the San Juan, Gunnison, and Green rivers (Bezzerides and Bestgen 2002). Data on smaller tributary systems are largely unavailable, and population abundance estimates are available only for short, isolated river reaches (Bezzerides and Bestgen 2002). In the Lower Colorado River basin, current estimates of roundtail chub distribution are as low as 18 percent of their former range (Voeltz 2002). Petitions to list Arizona and New Mexico populations of roundtail chub under the Endangered Species Act were filed in April 2003.

Statement of habitat needs and threats to the species. Roundtail chubs utilize slow moving, deep pools for cover and feeding, utilizing a variety of substrate types (silt, sand, gravel and rocks) and preferring turbid water over clear (Sigler and Sigler 1996, Brouder et al. 2000). Habitat use varies with life stage. Adults are found in eddies and pools adjacent to strong current and use in-stream boulders as cover (Sigler and Sigler 1996, Brouder et al. 2000). Juveniles and young-of-year are found in quiet water near shore or backwaters with low-velocity flows and pools rather than glides and riffles.

Roundtail chub populations are subjected to many threats, including hybridization with other *Gila* species, habitat loss and degradation resulting from the construction of dams and reservoirs, competition and predation by introduced nonnative fish species, and parasitism (Bezzerides and Bestgen 2002). Excessive dewatering of stream habitats for agricultural,

municipal, or industrial purposes can eliminate roundtail chub habitat when flows drops to 10 cfs or less (USFWS 1989). Stefferud (2000) showed that abundance of roundtail chubs in the Verde River, Arizona, was inversely related to abundance of red shiners *(Cyprinella lutrensis).* Other abundant nonnative predators in the Upper Colorado River Basin include channel catfish *(Ictalurus punctatus)*, green sunfish *(Lepomis cyanellus)*, yellow bullhead *(Ameiurus natalis)*, and crayfish, all of which have reduced roundtail chub abundance (Bestgen and Probst 1989; Voeltz 2002). Finally, more than a dozen fish parasites are known to infect roundtail chub, which negatively impacts their growth and condition (Voeltz 2002).

Anticipated costs and savings. Preventing the roundtail chub from being listed under the ESA should reduce mitigation costs of water development where they occur in Utah. Measures taken to conserve roundtail chub populations should also benefit bluehead and flannelmouth suckers.

Rationale for proposed designation. Documented losses of roundtail chub populations in Utah during recent decades (Cavalli 1999) along with threats posed by continued water development and nonnative fish warrant listing the roundtail chub as a Species of Concern.

3.3 *Catostomus clarki,* desert sucker

Species status statement. Desert suckers inhabit small- to medium-sized rivers in the Lower Colorado River Basin. In Utah, they are found in the Virgin River drainage. Adults are usually collected in runs and riffles over gravel and cobble (Sublette et al. 1990) and have been frequently collected in association with cover, such as boulders and overhanging vegetation (Cross 1975). During spring months, desert suckers spawn in riffles over cobble-rubble substrates (Cross 1975). After hatching, larvae utilize low velocity flows. As they mature, desert suckers move to swifter currents, and they assume an omnivorous diet consisting of diatoms, filamentous algae, and aquatic invertebrates (Sublette et al. 1990). Maximum total length and life expectancy of desert suckers are approximately 330 mm and eight to ten years, respectively (Sigler and Sigler 1996).

In Utah, the desert sucker is found only in the Virgin River drainage. Desert suckers are captured during monitoring efforts for sympatric species, but little synthesis of population data

exists. From 1994 to 1996, the desert sucker was listed in the Federal Register as a Category 2 candidate species.

Statement of habitat needs and threats to the species. Desert suckers require a variety of habitat types to complete their life cycle. Larvae require low velocity areas and move toward swifter currents as they mature. Adults occur in runs and riffles, often associated with large boulders and overhanging vegetation, and spawn in cobble riffle substrate. Populations are threatened by water development in the Virgin River basin. Based on studies of endangered Virgin River fishes (Valdez et al. 1991; Lentsch et al. 2002) at least 38 percent of the drainage basin is currently dewatered or depleted of water. At least 11 percent of riparian areas have been degraded by agriculture, recreation, development, channelization, and barriers such as dams and diversions (Lentsch et al. 2002). Populations are also reduced by predation and competition with nonnative fishes, such as the red shiner (USFWS 1994), the largemouth bass *(Micropterus salmoides),* and the black bullhead (*Ameiurus melas;* Fridell et al. 2003), which occupy a considerable fraction of the Virgin River basin (Lentsch et al. 2002).

Anticipated costs and savings. Preventing the desert sucker from being listed under the ESA should reduce mitigation costs of water development in Washington County. Measures taken to conserve desert sucker populations should benefit other sensitive species such as the flannelmouth sucker.

Rationale for proposed designation. Extremely limited geographical occurrence in Utah, competition and predation, habitat loss, and the negative impacts of water development warrant listing desert sucker as a Species of Concern.

3.4 *Catostomus discobolus,* bluehead sucker

Species status statement. Bluehead suckers occur in small to large streams and rivers and tributaries in the Upper and Lower Colorado River basin and in the Weber and Bear River drainages in the Bonneville basin. Large adult bluehead suckers may inhabit stream environments as deep as two to three meters, although they most commonly feed in riffles and swift runs (Sigler and Sigler 1996). Life expectancy of bluehead suckers is typically six to eight years. Spawning occurs in spring and early summer at lower elevations and mid- to late summer in higher, colder waters. Most mature at two years of age, and spawning is initiated at about

15°C (60°F) (Sigler and Sigler 1996). Spawning occurs on gravel beds in shallow water. Eggs are deposited in a shallow redd excavated in stream gravel. Fecundity is proportional to fish size and also varies with environmental conditions. Smaller fish have been reported to produce as few as 5,000 eggs and larger females from warmer waters produced up to 20,000 eggs (Sigler and Sigler 1996, Bezzerides and Bestgen 2002).

Bluehead suckers historically occurred in the Colorado River Basin above the mouth of the Grand Canyon in mainstem and tributary habitats (Bezzerides and Bestgen 2002). In Utah, bluehead suckers continue to be found in mainstream rivers and tributary streams above Glen Canyon Dam to headwater reaches of the Green and Colorado rivers (Bezzerides and Bestgen 2002). Populations occur in the Dirty Devil, Fremont, San Rafael, Price, and Duchesne rivers; in the upper Bear River drainages (Sigler and Sigler 1996); in the mainstem Green River from the Colorado River confluence upstream to Lodore, Colorado; in the White River from the Green River confluence upstream to near Meeker, Colorado; in the San Juan River, Utah, New Mexico, and Colorado; in the Colorado River from Lake Powell upstream to Kremmling, Colorado; and in the Dolores River from the Colorado River Confluence in Utah upstream to McPhee Reservoir, Colorado.

In the upper Colorado River Basin (Utah, Wyoming, Colorado, and New Mexico), bluehead suckers currently occupy approximately 45 percent of their historical habitat. Recent declines of bluehead suckers have occurred in the White River below Taylor Draw Dam (Utah and Colorado), and in the upper Green River (Holden and Stalnaker 1975; Bezzerides and Bestgen 2002). Bluehead sucker have been extirpated in the Gunnison River, Colorado above the Aspinall Unit Reservoirs (Wiltzius 1978). Bluehead suckers were documented in the Escalante River during the 1970's, but were absent from samples collected in recent years (Mueller et al. 1998).

Statement of habitat needs and threats to the species. Bluehead sucker populations are threatened by hybridization, altered hydrological regimes, in-stream habitat loss and degradation, and predation by introduced nonnative fishes. Bluehead suckers hybridize with white suckers (*C. commersoni;* Holden and Stalnaker 1975). Altered hydrological regimes in the upper Colorado River basin have adversely impacted spawning and rearing sites (Holden and Stalnaker 1975; Sigler and Sigler 1996). Marsh and Douglas (1997) quantified predation on bluehead

suckers by rainbow trout *(Oncorhyncus mykiss)* and channel catfish *(Ictalurus punctatus)*, the latter of which is abundant throughout the Colorado River basin in Utah (Holden and Stalnaker 1975; UDWR unpublished data).

Anticipated costs and savings. Preventing the bluehead sucker from being listed under the ESA should reduce mitigation costs of water development where they occur in Utah. Measures taken to conserve bluehead suckers should also benefit flannelmouth suckers and roundtail chubs.

Rationale for proposed designation. Susceptibility of bluehead suckers to predation, hybridization, and habitat loss impacts of water development, including habitat loss, warrant listing this fish as a Species of Concern.

3.5 *Catostomus latipinnis,* flannelmouth sucker

Species status statement. Flannelmouth suckers are typically found in deep water habitats of large rivers, but are also found in small streams and occasionally in lakes (Sigler and Sigler 1996). Data indicate poor survival of flannelmouth suckers in reservoirs (Bezzerides and Bestgen 2002). Flannelmouth suckers typically spawn during March and April in the southern part of the state and from May to June in the North and higher elevation waters. Fecundity of females is proportional to fish size and varies with environmental conditions. Number of eggs produced ranges from 4,000 to 33,000 per female (Bezzerides and Bestgen 2002).

Extant flannelmouth sucker populations include those in the Escalante, Fremont, San Rafael, Price, and Duchesne rivers; the mainstem San Juan River and tributaries; the Colorado River from Lake Powell upstream to near Glenwood Springs, Colorado; the Dolores River; the Green River from the Colorado River confluence upstream to Flaming Gorge Reservoir; and the White River from the Green River confluence to Kenny Reservoir, Colorado. Populations usually do not persist in impoundments, including Flaming Gorge Reservoir and Lake Powell (Bezzerides and Bestgen 2002).

Recent investigation of historical accounts, museum specimens, and comparison with recent observations indicate that flannelmouth suckers occupy approximately 50 percent of their historic range in the Upper Colorado River Basin (Utah, Wyoming, Colorado, and New Mexico; Bezzerides and Bestgen 2002). Populations have declined since the 1960s due to impoundment

of the mainstem Green River in Wyoming and Utah (Flaming Gorge Reservoir) and the Colorado River in Glen Canyon, Utah (Lake Powell). Flannelmouth suckers have been extirpated from the Gunnison River above the Aspinall Reservoirs (Bezzerides and Bestgen 2002).

Statement of habitat needs and threats to the species. Large adult flannelmouth suckers are generally more abundant over coarse substrates rather than sand or silt. Young fish utilize lower velocity flows than adults and are frequently found in backwaters, eddies, side channels, and shallow riffles (Sigler and Sigler 1996). Reported water temperatures associated with spawning activities range from 6 to 18.5°C (43 to 65°F; Bezzerides and Bestgen 2002). The adhesive eggs are usually laid over sand and gravel bars in shallow water.

Flannelmouth sucker populations are threatened by hybridization, altered hydrological and thermal regimes, dams and impoundments, in-stream habitat loss and degradation, and competition and predation by introduced nonnative fishes. Flannelmouth suckers hybridize with razorback suckers (*Xyrauchen texanus;* Hubbs and Miller 1953; Buth et al. 1987; Dowling et al. 1996; Douglas and Marsh 1998) and white suckers (*C. commersoni;* Holden and Stalnaker 1975). Altered hydrological regimes in the upper Colorado River basin have adversely impacted spawning, feeding, and rearing sites (Sigler and Sigler 1996; Chart and Bergersen 1992). Discharge of cold, hypolimnetic water from reservoirs can reduce survival of flannelmouth sucker larvae (Ward et al. 2002). Additionally, dams and diversions block long-range migrations of flannelmouth suckers (Chart and Bergersen 1992; McKinney et al. 1999). Marsh and Douglas (1997) quantified predation on flannelmouth suckers by rainbow trout *(Oncorhyncus mykiss)* and channel catfish *(Ictalurus punctatus).* The latter is abundant throughout the Colorado River basin in Utah. Finally, high rates of parasitism and disease (Gaulfin et al. 1960; Landye et al. 1999) pose additional threats to population viability.

Anticipated costs and savings. Preventing the flannelmouth sucker from being listed under the ESA should reduce mitigation costs of water development where it occurs in Utah. Measures taken to conserve flannelmouth suckers should also benefit the bluehead sucker and the roundtail chub.

Rationale for proposed designation. Susceptibility of flannelmouth sucker populations to altered thermal and hydrologic regimes, hybridization, and competition and predation warrant listing this fish as a Species of Concern.

3.6 *Oncorhynchus clarki bouvieri,* Yellowstone cutthroat trout

Species status statement. The distribution and abundance of the Yellowstone cutthroat trout have declined from historical levels (Thurow et al. 1988; Varley and Gresswell 1988; Kruse et al. 2000). The species was recently petitioned for listing under the ESA as a threatened species, and it is listed as a Species of Concern by the American Fisheries Society (Johnson 1987) and as a sensitive species by the U.S. Forest Service (Gresswell 1995). In Utah, the only native populations of Yellowstone cutthroat trout occur predominantly in 55.8 stream kilometers (34.7 miles) of the Raft River drainage and in Goose Creek in Box Elder County (Thompson 2002).

Statement of habitat needs and threats to the species. Yellowstone cutthroat trout inhabit clear, cold streams, small rivers and lakes; they prefer cold, clear streams with pool-riffle ratios of about 1:1 and gravel and rubble substrates with abundant in-stream and overhanging cover. They are rarely found in waters exceeding 22ºC (72ºF) (Sigler and Sigler 1996). Fry survival depends on availability of pool habitat.

Yellowstone cutthroat trout are threatened by hybridization, disease, and habitat loss. Introduced populations of rainbow trout *(Oncorhynchus mykiss)* pose a considerable threat of hybridization and occur in roughly one-third of streams occupied by Yellowstone cutthroat trout in the Raft River drainage (Thompson 2002). The proliferation of whirling disease in Utah since 1991 has extended to Great Basin drainages, increasing the risk of transmission to the Raft River and other northwestern drainages. Cutthroat trout are among the species most susceptible to impacts of whirling disease, a premise that has been used for petitioned listing of the Rio Grande cutthroat trout (*O. c. virginalis;* Bruce May, U.S. Forest Service, unpublished). Finally, overgrazing and water development pose additional threats to Yellowstone cutthroat trout in the form of riparian cover and in-stream flow losses (Sigler and Sigler 1996).

Anticipated costs and savings. Preventing the Yellowstone cutthroat trout from being listed under the ESA should reduce or prevent the need to mitigate and/or restrict water development, grazing, mining, recreation, or other land uses in Box Elder County.

Rationale for proposed designation. The extremely limited geographical occurrence in Utah and risk of losses through hybridization and/or whirling disease warrant listing the Yellowstone cutthroat trout as a Species of Concern.

3.7 *Prosopium abyssicola,* Bear Lake whitefish

Species status statement. Spawning of Bear Lake whitefish occurs in areas of the lake greater than 15 meters (50 feet) deep (Sigler and Sigler 1987, 1996). Bear Lake whitefish appear to be relatively late to achieve sexual maturity. Ward (2001) determined an average age of 6.8 years in the spawning population. Thompson (2003) did not collect ripe females until lengths approached those associated with the age-3 year class. It is unknown if repeat spawning occurs. Repeat spawning may explain the differences noted in age at maturity. Thompson (2003) aged Bear Lake whitefish to 37 years old, and several fish were aged to 25 years old. None measured exceeded a total length of 270 mm. Ward (2001) aged a single individual at 18 years; however, most of his specimens were aged 10 years or younger. Thompson (2003) determined fecundity of adult Bear Lake whitefish to be approximately 790 eggs for gravid adult (approximately 250 mm TL) fish.

Until recently, differentiation of the two endemic whitefishes of Bear Lake (Bonneville whitefish and Bear Lake whitefish) at lengths less than 250 mm TL was not possible when the fishes were not in spawning condition (Tolentino and Thompson, in press). Prior to 1999, sampling results combined the two species into a single whitefish complex (Nielson and Tolentino 2002a). Gill-net catches of the combined whitefish complex have been highly variable through the years (Tolentino and Nielson 1999), but have recently reached a peak in the mid-1990s of 1.3 fish per net hour and have been declining to near the historical catch rates of approximately 0.5 fish per hour since that time (Nielson and Tolentino 2002a).

Statement of habitat needs and threats for the species. Bear Lake whitefish are a deep water species dependent on invertebrate species for food, eating mainly ostracods (Thompson 2003, Tolentino and Thompson, in press). Degraded water quality could directly (habitat

degradation) or indirectly (prey species reduction) impact Bear Lake whitefish. Late maturation and relatively low fecundity make the Bear Lake whitefish at greater risk of population reduction or loss than species that mature quickly and produce large numbers of eggs (Nelson and Soulé 1987, Eisenberg and Harris 1989). Increasing human habitation and recreation in the Bear Lake basin increases the impacts to lake water quality (Sigler and Sigler 1996).

In UDWR samples, the Bear Lake whitefish comprised between 12 and 15 percent of the total whitefish catch from 1999-2001, with most of the Bear Lake whitefish being caught in the deepest (35 m deep) net. Concurrent sampling conducted by Utah State University in depths up to 60 m has determined that the Bear Lake whitefish population is found almost exclusively from 40 to 60 m in depth. The preference of deep water has also been observed in "dwarf" whitefish living sympatrically with other whitefish in several European lakes and reservoirs and is likely related to specialization of ostracods for food (Svardson 1953, Behnke 1972, Mann and McCart 1981, Pigeon et al. 1997, Heikinheimo 2000, Amundsen$_1$ et al., in press, Amundsen$_2$ et al. in press, Tolentino and Thompson, in press).

Anticipated costs and savings. Maintenance of a high quality aquatic habitat benefits the fish and reduces the need for state or federal regulatory involvement in the economic affairs of this area. Maintenance of a high quality aquatic habitat also benefits those who enjoy recreation on the lake (fishing, boating, swimming) and the businesses that cater to them. If Bear Lake whitefish numbers were to be reduced due to habitat/water quality degradation, government imposed recreation and development restrictions in the basin could result.

Rationale for proposed designation. The Bear Lake whitefish is one of the four species of fish found nowhere else in the world but the unique Bear Lake of northern Utah. They are in the same family as salmon and trout, Salmonidae. Allendorf and Waples (1996) call for protection of remaining unique salmonids, especially those that occupy unique habitats, because of the global trend of losses of these fishes. The Bear Lake whitefish is a unique Utah wildlife resource that could be vulnerable to degraded water quality and quantity in an area experiencing increasing human habitation, and so is designated a Species of Concern.

3.8 *Prosopium gemmifer,* Bonneville cisco

Species status statement. Bonneville cisco are small fish (rarely longer than 200 mm; Sigler and Sigler 1996) but can reach sizes of 260 mm total length when adequate food is available (UDWR unpublished data). They usually mature at age three and rarely live past age seven. Females typically produce 2,000-3,000 eggs that are broadcast indiscriminately on the bottom in shoreline habitats at depths of a few centimeters to 12 meters (2 inches to 40 feet; Sigler and Workman 1978). Nielson and Tolentino (2002a) found eggs deposited on all available substrates, however, egg predation by Utah suckers (*Catostomus ardens*), whitefish (*Prosopium* spp.), and Bear Lake sculpins (*Cottus extensus*) may reduce survival in habitats other than rocky bottoms with abundant interstitial spaces.

From 1990-1999, the Bonneville cisco population has been estimated to be approximately 2.5 million individuals based on hydroacoustic surveys at Bear Lake. However, the population experienced a significant increased in 2000-2001 to 7.7 million and 9.7 million, respectively. This sharp increase was likely due to high reproductive success in the late 1990s when the water level of the lake was near full pool, illustrating this species' sensitivity to lake level fluctuations. The increased abundance of large zooplankton during the early 1990s suggested reduced foraging rates by, and possibly reduced population size of, Bonneville cisco. The mean size of cisco in the spawning population increased somewhat in the mid-1990s possibly due to an increase in *Daphnia* populations, which was possibly caused by nutrients being released from shoreline areas due to wave action during the period of low water years in the late 1980s and early 1990s (Nielson and Tolentino 2002a). The increase in population size of cisco in 2000-2001 was accompanied by an overall decrease in average fish size due to young year classes of cisco being caught in gillnets (Nielson and Tolentino 2002b).

Statement of habitat needs and threats for the species. Threats to this species include extended lake draw downs (Bouwes and Luecke 1997), which can expose rocky spawning substrate, and increased development of the Bear Lake valley (Sigler and Sigler 1996). Because they tend to form schools and often spawn very near to the shore, Bonneville cisco are also vulnerable to increased predation and reproductive failure due to lowered water levels(Bouwes and Luecke 1997). Reduced lake levels or decreased water quality may negatively affect Bonneville cisco populations due to dewatering of littoral, rocky habitat over which they spawn.

Anticipated costs and savings. Protection of Bonneville cisco and their habitat is of economic and aesthetic value to the local Bear Lake community and the state. Maintenance of a high quality aquatic habitat benefiting the fish reduces the need for state or federal regulatory involvement in the economic affairs of this area. Maintenance of a high quality aquatic habitat also benefits those who enjoy recreation on the lake (fishing, boating, swimming) and the businesses that cater to them. If Bonneville cisco numbers were to be severely reduced due to habitat degradation, recreation and development restrictions in the basin could result.

Rationale for proposed designation. The Bonneville cisco is one of the four species of endemic fish in Bear Lake. The Bonneville cisco is a unique Utah wildlife resource that, especially during spawning, is vulnerable to degraded water quality and quantity in an area experiencing increasing human habitation, and so is designated a Species of Concern. Protection of Bonneville cisco and their habitat is of economic value to the local Bear Lake community and the state.

3.9 *Prosopium spilonotus,* Bonneville whitefish

Species status statement. Bonneville whitefish appear to achieve sexual maturity at age three, but some individuals may not mature until much later (Ward 2001). Insufficient data exist to determine the extent of repeat spawning, which may explain the differences noted in age at maturity; however, a current study is underway by Utah State University which will address this. McConnell et al. (1957) reported the average lifespan of Bonneville whitefish to be six to eight years. Ward (2001) aged a single individual at 33 years, and numerous individuals were determined to be up to 20 years of age. Subsequent aging of Bonneville whitefish using fin rays revealed ages over 18 years old on a fish that measured 435 mm TL; however, other fish experienced good growth and were only eight years old for a fish of the same size.

Sigler (1958) reported a 225 mm total length female as producing 1,200 eggs. Thompson (2003) reported a 450 mm female to have over 11,000 eggs. Spawning areas may be limited to the shallow, rocky shorelines of the lake (Sigler and Sigler 1987, 1996). They utilize shallow water more than either Bear Lake whitefish or Bonneville cisco (Sigler and Sigler 1996), although specific research has not been directed toward this characteristic.

Until recently, differentiation of the two endemic whitefishes of Bear Lake (Bonneville whitefish and Bear Lake whitefish) was not possible when the fish were not in spawning condition (Tolentino, UDWR, personal communication, 2002). Sampling results therefore have typically combined the two species into a single whitefish complex (Nielson and Tolentino, 2002a). Gill-net catches of the combined whitefish complex have been highly variable through the years (Tolentino and Nielson 1999), but recently reached a peak in the mid-1990s of 1.3 fish per net hour and have been declining to near the historic catch rates of approximately 0.5 fish per hour (Nielson and Tolentino 2002a). The UDWR has sub-sampled contour gill-net catches of whitefish from 1999-2001 and has determined that Bonneville whitefish comprised between 85 to 88 percent of the total whitefish catch, with most of the Bonneville whitefish being caught in depths of 35 m and less. Concurrent sampling conducted by USU in depths up to 60 m corroborated this data and found that less than 4 percent of Bonneville whitefish were caught in gill nets at depths exceeding 35 m (115 feet; Thompson 2003).

Statement of habitat needs and threats for the species. Increases in native or nonnative predatory fish populations (trout species) utilized as sport species could depress the Bonneville whitefish population (Sigler and Sigler 1996), so the trout must be managed appropriately. Because of their need for relatively shallow, near-shore habitats for at least part of their life cycle, Bonneville whitefish may be negatively affected by decreases in water level (Bouwes and Luecke 1997). Degraded water quality, potentially as a result of increased human residence and recreation in the basin and in Bear Lake, would negatively affect Bonneville whitefish and the other fish of Bear Lake (Sigler and Sigler 1996). Water quantity and quality in Bear Lake must be protected for all of the aquatic species found there.

Anticipated costs and savings. Protection of Bonneville whitefish and their habitat is of economic and aesthetic value to the local Bear Lake community and the state, since these fish provide a winter season (December to February) sport fishery on Bear Lake. Maintenance of a high quality aquatic habitat benefiting the fish reduces the need for state or federal regulatory involvement in the economic affairs of this area. Maintenance of a high quality aquatic habitat also benefits those who enjoy recreation on the lake (fishing, boating, swimming) and the businesses that cater to them. If Bonneville whitefish numbers were to be reduced due to habitat degradation, recreation and development restrictions in the basin could result.

Rationale for proposed designation. The Bonneville whitefish is one of the four endemic species of fish in Bear Lake. The Bonneville whitefish is a unique Utah wildlife resource that, especially during spawning, is vulnerable to degraded water quality and quantity in an area experiencing increasing human habitation, and so is designated a Species of Concern.

3.10 *Cottus extensus,* Bear Lake sculpin

Species status statement. The Bear Lake sculpin is the only extant lake-dwelling sculpin (*Cottus* sp.) in Utah. McConnell et al. (1957) initially reported that gill-netted sculpin averaged 75 mm, were widely distributed throughout the lake and were an important forage for Bonneville cutthroat trout *(Oncorhynchus clarki utah),* lake trout *(Salvelinus namaycush),* and Bonneville whitefish *(Prosopium spilonotus).* Neverman (1989) described in detail the diurnal movements and food habits of underyearling sculpin. Adults migrate from the deep areas to shallow, rocky littoral areas in April and May for spawning (Sigler and Sigler 1996). It was noted during sculpin collection efforts by UDWR in 1981 that males were found guarding multiple egg masses ranging from 100 to 400 eggs each. Presumably different females deposited these egg masses, and each mass represents a full clutch of eggs from a female.

Sigler and Sigler (1987, 1996) reported that the Bear Lake sculpin "is probably the second most abundant fish in Bear Lake." The population has been estimated to comprise 2 million individuals.

Statement of habitat needs and threats for the species. The Bear Lake sculpin spawns in rock and cobble substrates in near-shore areas (Sigler and Sigler 1996). Potential spawning at other depths and substrates, and relationships to water quality requires additional study. Changes in water quality and water depletions that lower the lake level may impact the reproductive success of this and other Bear Lake native fish species (Bouwes and Luecke 1997), and maintenance of a high quality aquatic habitat in Bear Lake is essential for its continued survival. With the increasing popularity of the Bear Lake basin for human habitation and recreation, there is potential for water quality degradation (Sigler and Sigler 1996). The Bear Lake sculpin is an important prey species for both trout species and Bonneville whitefish (Sigler and Sigler 1996).

Anticipated costs and savings. Protection of Bear Lake sculpin and their habitat is of economic and aesthetic value to the local Bear Lake community and the state. Maintenance of a high quality aquatic habitat benefits the fish and reduces the need for state or federal regulatory

involvement in the economic affairs of this area. Maintenance of a high quality aquatic habitat also benefits those who enjoy recreation on the lake (fishing, boating, swimming) and the businesses that cater to them. If Bear Lake sculpin numbers were to be reduced due to habitat degradation, government imposed recreation and development restrictions in the basin could result.

Rationale for proposed designation. The Bear Lake sculpin is a unique fish that is endemic to Bear Lake, Utah-Idaho. It is one of the four fish species found only in Bear Lake, and so is a unique Utah resource. It is a species that may be vulnerable to degraded water quality and lowered lake volume in an area experiencing increasing human use and is designated a Species of Concern.

4. Class: Amphibia, Amphibians

4.1 *Bufo boreas*, western toad

Species status statement. Due to the absence of populations in many historically occupied habitats, the western toad in Colorado, Wyoming, and New Mexico is currently warranted for listing as endangered under the federal Endangered Species Act of 1973, as amended, but precluded due to higher priorities (USFWS 1995). In Utah, the historical distribution included high elevation areas in 21 of the 29 counties. Western toad populations currently occur in only ten Utah counties: Box Elder, Cache, Rich, Wasatch, Summit, Sevier, Piute, Wayne, Garfield, and Kane (Thompson and Chase 2001, Thompson et. al 2003). Molecular data suggest that gene flow among most Utah populations is extremely limited (Hogrefe 2001). Gene flow is probably precluded by the large distances and lack of migration corridors between habitats. Hogrefe (2001) indicated that levels of genetic variability within populations were low compared to other amphibians, likely due to a combination of founder effects and recent population bottlenecks. Low levels of genetic variability may limit the ability of populations to adapt to changing environmental conditions or new threats.

Statement of habitat needs and threats for the species. Timber harvest, livestock grazing, and recreational use have degraded many important wetland and upland western toad habitats and may directly cause toad mortality. Roads near breeding habitats represent dispersal barriers, and road traffic can be a significant source of mortality (Fahrig et al. 1995). The distribution and abundance of raccoons (*Procyon lotor*) has increased dramatically in recent decades; this species preys upon western toads, and high rates of mortality due to predation have been observed elsewhere in the range (Olson 1989). Since it is likely that several historical populations along the Wasatch Front near Salt Lake City and Provo were extirpated as a result of development, current *Bufo boreas* populations should be protected from future human impacts either directly or through habitat protection. Chytrid fungus infection has been detected in a single Utah western toad population. This fungus has been implicated in severe amphibian die-offs world-wide (Fellers et al. 2001), and it could pose a significant threat to the western toad in Utah.

Anticipated costs and savings. Protection of the western toad is of economic value to the state of Utah. Due to the absence of populations in many historically occupied habitats in Colorado, Wyoming, and New Mexico, *Bufo boreas* is currently warranted for listing as

endangered under the Endangered Species Act of 1973, as amended, but precluded due to higher priorities (USFWS 1995). If *B. boreas* numbers were to be reduced due to habitat degradation and fragmentation, the result may be government-imposed restrictions on recreation and development.

Rationale for proposed designation. The limited distribution of the western toad make this species susceptible to habitat loss, degradation and fragmentation in an area experiencing increasing human habitation. Because of these reasons, it is designated a Species of Concern.

4.2 *Bufo microscaphus*, Arizona toad

Species status statement. This toad is irregularly and locally distributed in southwestern states. In Utah, the Arizona toad is restricted to the southern portion of the state. Populations are concentrated within the Virgin River basin in Washington County, but the species also occurs in areas of Kane and Iron counties (Schwinn and Minden 1979). Although the species can be locally abundant, populations are typically localized in lowland riparian habitat.

Statement of habitat needs and threats for the species. Habitat loss due to rapid human development in Washington County threatens the Arizona toad. Poorly managed livestock grazing has also degraded many riparian areas where the Arizona toad occurs. Water diversion and storage for municipal and agricultural purposes have altered natural flow regimes and caused regular de-watering of many occupied river reaches. Reservoir construction has caused inundation of several miles of historically occupied habitat. Existing Arizona toad habitat, specifically within riparian zones, needs to be protected to maintain viable populations. Several nonnative fishes in the Virgin River may be a cause of significant mortality due to predation on eggs, tadpoles, or subadult life stages. Alteration of Virgin River habitats has allowed Woodhouse's toads (*Bufo woodhousii*) to colonize Arizona toad habitats. In these areas, Arizona toad populations may be lost due to competition or hybridization. The genetic integrity of some Arizona toad populations has been compromised through hybridization with Woodhouse's toad (Sullivan 1993).

Anticipated costs and savings. The Arizona toad is listed as a special status species by the Bureau of Land Management in Nevada and is a Species of Special Concern in Arizona. If the Arizona toad numbers were to be reduced due to habitat degradation and fragmentation,

government imposed recreation and development restrictions could affect Washington, Iron and Kane counties.

Rationale for proposed designation. The limited distribution of the Arizona toad makes this species susceptible to habitat loss, degradation, and fragmentation in an area experiencing increasing human habitation. Because of these reasons and its vulnerability to loss of genetic diversity from hybridization, it is designated a Species of Concern.

5. Class: Reptilia, Reptiles

5.1 *Callisaurus draconoides,* zebra-tailed lizard

Species status statement. The range of the zebra-tailed lizard extends into the southern and western parts of Washington County (Stebbins 1985). The species occurs on the Beaver Dam Slope, in the greater St. George area, in Warner Valley, and in the vicinity of the municipalities of Leeds, Hurricane, Virgin and Springdale. The distribution reflects the specialized habitat requirements of this species.

Statement of habitat needs and threats for the species. The zebra-tailed lizard is associated with open areas with little vegetation, washes, and desert pavement and hardpan. Within these open areas, soils can be fine windblown sand, but the lizard is usually not far from firm soils. Open areas with firm soils increase the zebra-tailed lizard's ability to run and avoid predators (Stebbins 1985). Burrow systems within these open areas are used by the zebra-tailed lizard for thermoregulation and as escape routes from predators. In Arizona, increased numbers of zebra-tailed lizards were linked to substrate types associated with undisturbed riparian vegetation (Germaine and Wakeling 2001). The specialized habitat of open areas, firm soils, and undisturbed habitat limits the zebra-tailed lizard's distribution in Utah.

Expanding human populations within southwestern Utah have caused loss of zebra-tailed lizard habitat as well as fragmentation, degradation, and loss. In the last two decades, Washington County has experienced intense population growth resulting in a doubling of the region's population (Theis and Maas 1994). Growth projections predict a steady annual population increase (Theis and Maas 1994, Washington County Commission 1995), leading to additional habitat fragmentation, degradation, and loss due to increased development and recreational activities. Off-road vehicle use within washes degrades zebra-tailed lizard habitat by damaging existing vegetation and compacting soils. Soil compaction leads to changes in vegetation type (Hall 1980) and crushes burrow systems used by lizards for escape routes and thermoregulation. Bury et al. (1977) found reduced biomass, density, and diversity of reptiles in areas with heavy off-road vehicle use.

Anticipated costs and savings. Protection of zebra-tailed lizards and their habitat is of economic value to Washington County and the state. Maintenance of contiguous high quality

desert habitat benefiting the lizard reduces the need for state or federal regulatory involvement in the economic affairs of this area. Maintenance of high quality desert habitat also benefits those who enjoy recreation in the desert (hiking, camping, wildlife viewing) and the businesses that cater to them. If zebra-tailed lizard numbers were to be reduced due to habitat degradation and fragmentation, government imposed restrictions on recreation and development in the county could result.

Rationale for proposed designation. The limited distribution and specialized habitat requirements of the zebra-tailed lizard make this species susceptible to habitat loss, degradation, and fragmentation in an area experiencing increased human habitation, and so is designated a Species of Concern.

5.2 *Coleonyx variegatus*, western banded gecko

Species status statement. Within Utah the western banded gecko is found only in Washington County, occurring on the Beaver Dam Slope, near Gunlock, in the greater St. George area, in Warner Valley, and in Zion National Park. All Utah populations have been identified as the Utah banded gecko (*Coleonyx variegatus utahensis*), a subspecies of the western banded gecko, which is restricted to southwestern Utah, southern Nevada, and extreme northwestern Arizona. The range in Utah is limited by specialized habitat requirements.

Statement of habitat needs and threats for the species. Within Utah the western banded gecko primarily occurs in creosote-dominated vegetation communities, usually in rocky areas and along canyon walls of riparian zones. The specialized habitat requirements of the Utah banded gecko make populations vulnerable to habitat disturbance (Smith 1995, Pough et al. 1998). Expanding human populations and the resulting development in southwestern Utah have caused fragmentation, degradation, and loss of habitat. In the last two decades Washington County has experienced intense human population growth resulting in a doubling of the region's population (Theis and Maas 1994), and growth projections predict a steady annual population increase (Theis and Maas 1994, Washington County Commission 1995). Road construction associated with land development is also a potential threat to gecko populations; roads act as barriers to dispersal and increase mortality rates within gecko populations (Mader 1984, Fahrig et al. 1995). Habitat disturbance can result in the loss of microhabitats needed for predator avoidance and reproductive activities (Hecnar and M'Closkey 1998). Gecko populations are

also vulnerable to the effects of illegal collection and predation by domestic dogs and cats in developed areas (Minton 1968, Schaaf and Garton 1970, Orser and Shure 1972, Beebe 1973, Walker et al. 1996). These threats associated with urbanization and human population growth may have a cumulative effect, spatially as well as temporally, on Utah banded gecko populations (Theobald et al. 1997).

Anticipated costs and savings. Protection of Utah banded geckos and their habitat is of economic value to Washington County and the state. Maintenance of contiguous areas of high-quality desert habitat benefiting the lizard reduces the need for state or federal regulatory involvement in the economic affairs of this area. Maintenance of high-quality desert habitat also benefits those that enjoy recreation in the desert (hiking, camping, wildlife viewing) and the businesses that cater to them. If western banded gecko numbers were to be reduced due to habitat degradation and fragmentation, government imposed recreation and development restrictions in the county could result.

Rationale for proposed designation. The limited distribution and specialized habitat requirements of the western banded gecko make this species susceptible to habitat loss, degradation and fragmentation in an area experiencing increasing human habitation, and so is designated as a Species of Concern.

5.3 *Dipsosaurus dorsalis,* desert iguana

Species status statement. Within the state, the desert iguana occurs only in the extreme southwest corner of Washington County with populations limited to the Beaver Dam Slope. The distribution of the desert iguana is extremely limited in Utah.

Statement of habitat needs and threats for the species. This lizard inhabits the creosote-bursage desert community, and is associated with mounds of loose sand and patches of firm ground with scattered rocks. This lizard is tolerant of high temperatures and can remain active on hot, sunny days (Smith 1995). It often utilizes mammal burrows located near the base of cacti or bushes for thermoregulation and predator avoidance (Smith 1995). This lizard is primarily herbivorous, feeding primarily on leaves, buds, and flowers of the creosote bush (Smith 1995). Habitat loss is the major threat to this species. Specialized habitat requirements and life history characteristics make the desert iguana particularly susceptible to habitat loss (Smith 1995, Pough

et al. 1998). Populations have been impacted by habitat degradation from off-road vehicle use and cattle grazing, increased predation by domestic dogs and cats, and illegal collection (Minton 1968, Schaaf and Garton 1970, Orser and Shure 1972, Beebe 1973, Walker et al. 1996). Off-road vehicle use and cattle grazing degrade desert iguana habitat by damaging vegetation, compacting soils (Hall 1980), and crushing burrow systems used by lizards for escape routes and thermoregulation. Bury et al. (1977) found reduced biomass, density, and diversity of reptiles in areas of heavy off-road vehicle use. In addition, the introduction of nonnative plant species (i.e., *Bromus rubens, Bromus tectorum, Erodium cicatarium*) has altered habitat structure and increased fire potential. Roads act as barriers to dispersal and increase mortality (Mader 1984, Fahrig et al. 1995). In addition, this long-lived species has life history characteristics including delayed maturity, low fecundity, and high adult survivorship that may constrain the population's ability to respond to increased mortality (Krekorian 1984, Eisenberg and Harris 1989) and illegal collection pressures. If habitat is modified or lost, or animals are collected illegally, populations will have few opportunities for natural reinvasion and establishment, as desert iguanas have limited dispersal abilities (Krekorian 1984, Pough et al. 1998).

Anticipated costs and savings. Protection of desert iguanas and their habitat is of economic value to Washington County and the state. Maintenance of contiguous high quality desert habitat benefiting the lizard reduces the need for state or federal regulatory involvement in the economic affairs of this area. Maintenance of high quality desert habitat also benefits those that enjoy recreation in the desert (hiking, camping, wildlife viewing) and the businesses that cater to them. If desert iguana numbers were to be reduced due to habitat degradation and fragmentation, government imposed recreation and development restrictions in the county could result.

Rationale for proposed designation. The limited distribution, specialized habitat requirements and life history characteristics of the desert iguana make this species susceptible to habitat loss, degradation and fragmentation in an area experiencing increasing human habitation, and so is designated as a Species of Concern.

5.4 *Heloderma suspectum*, Gila monster

Species status statement. In Utah the distribution of the Gila monster is limited; populations are unevenly distributed in localized portions Washington County, including the

Beaver Dam Slope, Cedar Pocket Wash, Shivwits, Leeds, and the greater St. George area. Populations have declined as a result of development of Gila monster habitat.

Statement of habitat needs and threats for the species. This species occurs in desert habitat comprising scattered cacti, shrubs, and grasses. They often occur in rocky canyon bottoms or washes with substrate characterized by basaltic lava slopes or flows, boulder fields of loose Navajo sandstone, and gravelly or sandy soils (Beck 1990).

Threats to this species include habitat loss, increased predation, and illegal collection. (Minton 1968, Schaaf and Garton 1970, Orser and Shure 1972, Beebe 1973, Walker et al. 1996). Habitat loss associated with land development has resulted in the reduction of the occupied range in Washington County, and the destruction of habitat continues to be a threat to remaining populations. Expanding human populations and the resulting development within southwestern Utah have caused fragmentation, degradation, and loss to Gila monster habitat. In the last two decades, Washington County has experienced intense population growth resulting in a doubling of the region's population (Theis and Maas 1994). Growth projections predict a steady annual population increase (Theis and Maas 1994, Washington County Commission 1995). In addition to the loss of habitat, urbanization has also resulted in road construction. Roads that cross Gila monster habitat act as barriers to dispersal and increase mortality (Mader 1984, Fahrig et al. 1994).

Gila monsters are long-lived and have an intrinsically low reproductive rate. For this reason, populations have a limited capacity to recover from increased mortality rates or decreased reproductive success. Because they are nest predators and depend on unpredictably and irregularly distributed food sources, population densities are characteristically low. Inactive for long periods, Gila monsters seek shelter in mammal burrows, woodrat nests, and under rocks and boulders. Their relatively large home range size (Beck 1990) puts them at risk to both native and exotic predators (such as domestic dogs and cats), as well as automobiles (Pough et al. 1998). In addition, Gila monsters are heavily sought after by collectors and other reptile enthusiasts (Pough et al. 1988).

Anticipated costs and savings. Protection of Gila monsters and their habitat is of economic value to Washington County, the state, and humanity. Maintenance of contiguous high quality desert habitat benefiting the lizard reduces the need for state or federal regulatory

involvement in the economic affairs of this area. Maintenance of high quality desert habitat also benefits those that enjoy recreation in the desert (hiking, camping, wildlife viewing) and the businesses that cater to them. If Gila monster numbers were to be further reduced due to additional habitat degradation and fragmentation, government imposed recreation and development restrictions in the county could result. A leading new drug (Exendin IV) that effectively treats adult onset diabetes (which afflicts 17 million Americans) has been developed from a peptide discovered in venom samples of Gila monsters from Utah, showing the species to be of direct economic value to humans with the development of a treatment for adult onset diabetes based on an enzyme from the reptile's venom.

Rationale for proposed designation. The limited distribution, specialized habitat requirements, and life history characteristics of the Gila monster make this species susceptible to habitat loss, degradation and fragmentation in an area experiencing increased human habitation, and so is designated as a Species of Concern.

5.5 *Sauromalus ater,* common chuckwalla

Species status statement. The common chuckwalla is found in the southern portion of Washington County near Gunlock, the greater St. George area, Leeds, Zion National Park, and in south-central Utah in the vicinity of Glen Canyon, Kane County. The construction of Glen Canyon Recreational Area eliminated much of the common chuckwalla habitat in Kane County.

Statement of habitat needs and threats for the species. The common chuckwalla occurs in desert communities of creosote-bursage, blackbrush, and salt desert scrub (Smith 1995). The species is strictly herbivorous and browses on leaves, buds, flowers, and fruit (Behler and King 1995). This lizard is restricted to habitat with large rocks and boulders, often on rocky hillsides, outcrops or lava beds, which provide cover and basking locales (Smith 1995). The species has been impacted by habitat degradation and loss, increased predation, and illegal collection (Minton 1968, Schaaf and Garton 1970, Orser and Shure 1972, Beebe 1973, Walker et al. 1996). Expanding human populations and the resulting development within southwestern Utah have caused fragmentation, degradation, and loss of common chuckwalla habitat.

In the last two decades, Washington County has experienced intense population growth resulting in a doubling of the region's population (Theis and Maas 1994). Growth projections

predict a steady annual population increase (Theis and Maas 1994, Washington County Commission 1995) which will increase pressures on the remaining common chuckwalla populations. Human disturbance to critical habitat components can result in the loss of microhabitats needed for predator avoidance and reproductive activities (Hecnar and M'Closkey 1998). In addition, this long-lived species has life history characteristics including delayed maturity, low fecundity, and high adult survivorship that constrain the population's ability to respond to increased mortality (Abts 1987) and illegal collection pressures. If populations are lost as a result of habitat modification or illegal collection, remaining populations will have few opportunities for natural reinvasion and establishment, as chuckwallas have limited dispersal abilities (Pough et al. 1998).

Anticipated costs and savings. Protection of common chuckwallas and their habitat is of economic value to Washington and Kane counties and the state. Maintenance of contiguous high quality desert habitat benefiting the lizard reduces the need for state or federal regulatory involvement in the economic affairs of this area. Maintenance of high quality desert habitat also benefits those who enjoy recreation in the desert (hiking, camping, wildlife viewing) and the businesses that cater to them. If common chuckwalla numbers were to be further reduced due to additional habitat degradation and fragmentation, government imposed recreation and development restrictions in Washington, Garfield, and Kane counties could result.

Rationale for proposed designation. The limited distribution, specialized habitat requirements, and low dispersal abilities of the common chuckwalla make this species susceptible to habitat loss, degradation and fragmentation in an area experiencing increased human habitation, and so is designated as a Species of Concern.

5.6 *Xantusia vigilis,* desert night lizard

Species status statement. Two subspecies of desert night lizards exist in Utah, the common night lizard *(Xantusia vigilis vigilis)* and the Utah night lizard (*X. v. utahensis).* The common night lizard is found on the Beaver Dam Slope in southwestern Washington County, while the endemic Utah night lizard is found exclusively in Garfield and San Juan counties in southeastern Utah (Bezy 1982, Stebbins 1985).

Statement of habitat needs and threats for the species. The desert night lizard is found in arid and semiarid rocky areas (Bezy 1982). Concealing, protective vegetation, such as yuccas and agaves, as well as rock crevices, dead brush, trunks of downed Joshua trees, and other debris are characteristic of occupied habitat (Bezy 1982). This species is relatively sedentary and long-lived, surviving up to 10 years (Zwiefel and Lowe 1966, Bezy 1988).

Habitat modification is one of the primary threats to this species, and the specialized habitat requirements and life history characteristics of the night lizard make it extremely vulnerable to habitat disturbance (Smith 1995, Pough et al. 1998). Populations have been impacted by change in the vegetation community primarily due to grazing, destruction of protective ground cover, soil compaction, and an increase in predation and collection pressures (Minton 1968, Schaaf and Garton 1970, Orser and Shure 1972, Beebe 1973, Walker et al. 1996). Expanding human populations and the resulting development have caused fragmentation, degradation, and loss to desert night lizard habitat (Pough et al. 1998). In addition, roads act as barriers to dispersal and increase mortality (Mader 1984, Fahrig et al. 1995). Human disturbance, such as the harvesting of the critical habitat component *Yucca brevifolia*, can result in the loss of microhabitats needed for predator avoidance and reproductive activities (Hecnar and M'Closkey 1998). Long-lived species such as the desert night lizard have life history characteristics such as delayed sexual maturity and low reproductive potential that may constrain the population's ability to respond to increased mortality and illegal collection pressures (Zweifel and Lowe 1966).

Anticipated costs and savings. Protection of desert night lizards and their habitat is of economic value to Washington, Garfield, and San Juan counties, southeastern Utah, and the state. Maintenance of contiguous high quality desert habitat benefiting the lizard reduces the need for state or federal regulatory involvement in the economic affairs of this area. Maintenance of high quality desert habitat also benefits those that enjoy recreation in the desert (hiking, camping, wildlife viewing) and the businesses that cater to them. If desert night lizard numbers were to be further reduced due to additional habitat degradation and fragmentation, government imposed recreation and development restrictions in the county could result.

Rationale for proposed designation. The limited distribution, specialized habitat requirements, low dispersal abilities, and spatial isolation of the desert night lizard make this

species susceptible to habitat loss, degradation and fragmentation in an area experiencing increased human habitation, and so is designated as a Species of Concern.

5.7 *Crotalus cerastes,* sidewinder

Species status statement. Within Utah, the sidewinder is restricted in distribution, occurring only in the Mojave Desert of Washington County. A limited number of sidewinders occur in Utah. This species is considered sensitive due to limited distribution, specialized habitat requirements and life history characteristics.

Statement of habitat needs and threats for the species. The sidewinder inhabits desert communities characterized by open areas with sparse vegetation and loose sand, but may also be found in rocky or gravelly sites (Ernst 1992). Such open areas are well suited to the sidewinder's unique method of sideways or S-locomotion, which facilitates quick movement and reduces heat uptake when traversing hot surfaces (Stebbins 1985). This species is viviparous (embryos develop within the female body with nutritional support from the mother; young are born live), with seven to 12 young produced in a typical litter (Ernst 1992). This life history characteristic is a high energy trait requiring a sufficient prey base for reproduction to occur. The prey base of the nocturnal sidewinder consists mainly of small mammals and lizards (Secor 1994). Those same small mammals and lizards create burrow systems that the sidewinder utilizes for thermoregulation (Stebbins 1985).

According to Greene (1997), habitat destruction and fragmentation are the most frequent and severe causes for reductions in snake populations. The specialized habitat requirements and life history characteristics increase the sidewinder's susceptibility to these threats (Pough et al. 1998). Expanding human populations within southwestern Utah have caused fragmentation, degradation, and loss of sidewinder habitat. In the last two decades, Washington County has experienced intense growth, resulting in a doubling of the region's human population (Theis and Maas 1994). Growth projections predict a steady annual increase in the human population of Washington County (Theis and Maas 1994, Washington County Commission 1995). In addition to the threats from habitat modification, sidewinders and other rattlesnake species are often subject to human persecution.

Anticipated costs and savings. Protection of sidewinders and their habitat is of economic value to Washington County and the state. Maintenance of contiguous high quality desert habitat benefiting the snake reduces the need for state or federal regulatory involvement in the economic affairs of this area. Maintenance of high quality desert habitat also benefits those that enjoy recreation in the desert (hiking, camping, wildlife viewing) and the businesses that cater to them. If sidewinder numbers were to be further reduced due to additional habitat degradation and fragmentation, government imposed recreation and development restrictions in the county could result.

Rationale for proposed designation. The limited distribution, specialized habitat requirements and life history characteristics of the sidewinder make this species susceptible to habitat loss, degradation and fragmentation in an area experiencing increased human habitation, and so is designated as a Species of Concern.

5.8 *Crotalus mitchellii,* speckled rattlesnake

Species status statement. The speckled rattlesnake is narrowly distributed in Utah, occurring only on the Beaver Dam Slope of Washington County, in the extreme southwestern corner of the State. Hence, the speckled rattlesnake is rare in Utah.

Statement of habitat needs and threats for the species. The speckled rattlesnake occurs in desert and pinyon-juniper communities with salt desert scrub, creosote-bursage, and blackbrush understories. This species prefers rocky locations, but is sometimes found in areas of loose sand (Stebbins 1985). The speckled rattlesnake is mostly nocturnal, and preys primarily on small mammals, although lizards are also commonly consumed (Ernst 1992). Broods typically contain four to eight young, which are born in mid- to late summer (Ernst 1992).

According to Greene (1997), habitat destruction and fragmentation are the most frequent and severe causes for a reduction in snake populations. The speckled rattlesnake faces these threats within its limited Utah range, primarily due to expanding human populations. In addition, speckled rattlesnakes and other rattlesnake species are often subject to human persecution.

Anticipated costs and savings. Protection of speckled rattlesnakes and their habitat is of economic value to Washington County and the state. Maintenance of contiguous high quality

desert habitat benefiting the snake reduces the need for state or federal regulatory involvement in the economic affairs of this area. Maintenance of high quality desert habitat also benefits those that enjoy recreation in the desert (hiking, camping, wildlife viewing) and the businesses that cater to them. If speckled rattlesnake numbers were to be further reduced due to additional habitat degradation and fragmentation, government imposed recreation and development restrictions in the county could result.

Rationale for proposed designation. The limited distribution of the speckled rattlesnake makes this species susceptible to habitat loss, degradation, and fragmentation in an area experiencing increased human habitation, and so is designated as a Species of Concern.

5.9 *Crotalus scutulatus*, Mojave rattlesnake

Species status statement. The Mojave rattlesnake is narrowly distributed in Utah, occurring only on the Beaver Dam Slope of Washington County in the extreme southwestern corner of the State.

Statement of habitat needs and threats for the species. The Mojave rattlesnake inhabits desert communities and is most common in areas with scattered scrubby growth from plants such as creosote bush and mesquite (Stebbins 1985). The Mojave rattlesnake is primarily nocturnal during the summer and is only occasionally seen during early morning hours basking on rocks or near the mouths of burrows. The diet of this species consists mainly of rodents, reptiles, and bird eggs, and occasionally invertebrates (Ernst 1992). Young Mojave rattlesnakes are born in mid- to late summer, with litters containing between two and 13 live young (Ernst 1992). Bearing live young is a high energy life history trait requiring a sufficient prey base.

According to Greene (1997), habitat destruction and fragmentation are the most frequent and severe causes for reductions in snake populations. The Mojave rattlesnake faces these threats within its limited Utah range, primarily due to expanding human populations. In addition, Mojave rattlesnakes and other rattlesnake species are often subject to human persecution.

Anticipated costs and savings. Protection of Mojave rattlesnakes and their habitat is of economic value to Washington County and the state. Maintenance of contiguous high quality desert habitat benefiting the snake reduces the need for state or federal regulatory involvement in

the economic affairs of this area. Maintenance of high quality desert habitat also benefits those that enjoy recreation in the desert (hiking, camping, wildlife viewing) and the businesses that cater to them. If Mojave rattlesnake numbers were to be further reduced due to additional habitat degradation and fragmentation, government imposed recreation and development restrictions in the county could result.

Rationale for proposed designation. The limited distribution of the Mojave rattlesnake make this species susceptible to habitat loss, degradation and fragmentation in an area experiencing increased human habitation, and so is designated as a Species of Concern.

5.10 *Elaphe guttata,* cornsnake

Species status statement. Cornsnake populations in western Colorado and eastern Utah are disjunct from cornsnake populations east of the Continental Divide. In Utah, the species has been reported to occur in only a few localities in Uintah, Grand, and San Juan counties. The cornsnake is rarely observed and has been considered uncommon by several researchers (Woodbury and Woodbury 1942, Schwinn and Minden 1979, Cox and Tanner 1995). This species is considered sensitive because of its limited distribution in Utah and its potential for genetic uniqueness.

Statement of habitat needs and threats for the species. Cornsnake populations in Utah are disjunct from the primary geographic range of the species east of the Rocky Mountains and may be genetically distinct. This species occurs in a variety of habitats associated with riparian habitat, including rocky hillsides, forests, and canyons, but are usually observed near stream or river margins. In Utah, the cornsnake is associated with the Colorado River and Green River corridors. This nocturnal, secretive snake spends much of its time in rodent burrows. Rodents, bats, birds, insects, lizards, and other snakes are prey of cornsnakes.

Habitat degradation and vegetation changes are major threats to cornsnake populations in Utah. Flow regimes in the Colorado and Green rivers have been altered and minimized. This, in turn, influences what type and the successional stage of vegetation communities occurring in the riparian areas of these rivers. Illegal collection may pose another threat to this species. Cornsnakes are desirable snakes in the pet trade and collection could pose a threat to any small population in Utah.

Anticipated costs and savings. Protection of cornsnakes and their habitat is of economic value to Uinta, Grand, and San Juan counties and the state. Maintenance of high quality riparian habitat benefiting the snake reduces the need for state or federal regulatory involvement in the economic affairs of this area. Maintenance of high quality riparian habitat also benefits those that enjoy recreation along the rivers (fishing, rafting, hiking, camping, wildlife viewing) and the businesses that cater to them. If cornsnake numbers were to be further reduced due to additional habitat degradation and fragmentation, government imposed recreation and development restrictions in the county could result.

Rationale for proposed designation. The limited distribution and potential for genetic uniqueness of the cornsnake make this species susceptible to habitat loss, degradation, and fragmentation in an area experiencing increasing human habitation, is susceptible to illegal collection, and so is designated as a Species of Concern.

5.11 *Opheodrys vernalis*, smooth greensnake

Species status statement. In Utah, the smooth greensnake occurs in the Wasatch, Uinta, Abajo, and La Sal mountain ranges, and in the East Tavaputs Plateau. There are historical records of occurrence in eight Utah counties, including Salt Lake, Wasatch, Duchesne, Uintah, Utah, Carbon, Grand, and San Juan. The smooth greensnake is rarely observed in Utah.

Statement of habitat needs and threats for the species. Smooth greensnake habitat in Utah includes meadows and stream margins. The species is often associated with moist, grassy areas where its coloration offers camouflage. This species is active during the warm months and hibernates during winter. The smooth greensnake is primarily insectivorous, predominately eating terrestrial insects and spiders (Stebbins 1985).

Associated with riparian areas, the smooth greensnake is subject to several habitat threats, including livestock grazing, recreation, wetland loss, and human development. Poorly managed livestock grazing can degrade bank conditions and reduce riparian vegetation needed as cover. Recreation activities often concentrate near riparian areas. These activities can degrade habitat conditions such as cover; a reduction in cover and change in vegetation type can increase densities of potential predators. Wetland loss for agricultural and municipal purposes has occurred in areas occupied by the smooth greensnake, and additional losses are predicted for the

future (Lee 2001). Habitat loss due to human development is a concern in areas of rapid human population growth, such as Salt Lake, Utah, and Wasatch counties.

Anticipated costs and savings. Protection of smooth greensnakes and their habitat is of economic value to the eight Utah counties where it resides. Maintenance of high quality riparian habitat benefiting the snake reduces the need for state or federal regulatory involvement in the economic affairs of this area. Maintenance of high quality riparian habitat also benefits those that enjoy recreation along the streams (hiking, camping, fishing, wildlife viewing) and the businesses that cater to them. If smooth greensnake numbers were to be further reduced due to additional habitat degradation and fragmentation, government imposed recreation and development restrictions in the counties could result.

Rationale for proposed designation. The specialized habitat requirements of the smooth greensnake make this species susceptible to habitat loss, degradation and fragmentation in areas experiencing increased human habitation, and so is designated as a Species of Concern.

5.12 *Leptotyphlops humilis*, western threadsnake

Species status statement. The western threadsnake occurs in Utah only in Washington County. Reported localities for this species are few and include the vicinity of the Santa Clara River, Snow Canyon State Park, and areas immediately north of St. George. The western threadsnake is rarely encountered in Utah.

Statement of habitat needs and threats for the species. The threadsnake is a crevice dweller and burrower primarily inhabiting desert and pinyon-juniper communities up to 1,500 m (5,000 ft) in elevation (Wright and Wright 1994). These snakes are vulnerable to drying and generally live where there is damp subsoil (Stebbins 1985). They are often found in canyon bottoms or washes near permanent or intermittent streams (Wright and Wright 1994). Preferring moist, sandy, friable soil, the threadsnake burrows among shrub roots, beneath rocks, and near ant nests. The threadsnake lives most of its life underground, but may be found above ground at night or after heavy rain. Its prey consists primarily of ants but can include other invertebrates, such as larvae, spiders, millipedes, and centipedes (Wright and Wright 1994).

The primary threat to the threadsnake is habitat loss (Wright and Wright 1994). Limited distribution, specialized habitat requirements and life history characteristics make this species

susceptible to loss of habitat (Pough 1998). Human disturbance to critical habitat components can result in the loss of microhabitats needed for predator avoidance and reproductive activities (Hecnar and M'Closkey 1998) by the threadsnake. Expanding human populations and the resulting development within southwestern Utah have caused fragmentation, degradation and loss of threadsnake habitat. In the last two decades, Washington County has experienced intense population growth resulting in a doubling of the region's population (Theis and Maas 1994). Growth projections predict a steady annual population increase (Theis and Maas 1994, Washington County Commission 1995). In addition, roads act as barriers to dispersal and increase mortality (Mader 1984, Fahrig et al. 1994).

Anticipated costs and savings. Protection of threadsnakes and their habitat is of economic value to Washington County and the state. Maintenance of contiguous high quality desert habitat benefiting the snake reduces the need for state or federal regulatory involvement in the economic affairs of this area. Maintenance of high quality desert habitat also benefits those that enjoy recreation in the desert (hiking, camping, wildlife viewing) and the businesses that cater to them. If threadsnake numbers were to be further reduced due to additional habitat degradation and fragmentation, government imposed recreation and development restrictions in the county could result.

Rationale for proposed designation. The limited distribution, specialized habitat requirements and life history characteristics of the threadsnakes make this species susceptible to habitat loss, degradation and fragmentation in an area experiencing increased human habitation, and so is designated as a Species of Concern.

6. Class: Aves, Birds

6.1 *Ammodramus savannarum,* Grasshopper Sparrow

Species status statement. Grasshopper Sparrows breed from southern British Columbia and southern Alberta to southern Maine south to southern California, south-central Texas, and central Georgia, and east to North Carolina, Maryland, and New Hampshire. The main concentration of Grasshopper Sparrows is located in the Great Plains, from North Dakota south to northern Texas, and east to Illinois (Dechant et al. 2001). In Utah, the Grasshopper Sparrow is limited to the northernmost region of the state in conjunction with native grassland and fields enrolled in the Conservation Reserve Program (CRP) (Goodell and Howe 1999).

Grasshopper Sparrows have experienced significant range-wide population declines over the past few decades. Although the introduction of the Conservation Reserve Program has mitigated this downward trend (McCoy et al. 1999), the Breeding Bird Survey (BBS) indicates that Grasshopper Sparrows continue to exhibit large population declines over much of their breeding range. In the Western Region of the United States, Grasshopper Sparrow populations have shown a 7.9% decrease per year for the last 20 years (Sauer et al. 2001).

Statement of habitat needs and threats for the species. The Grasshopper Sparrow is dependent on dry grassland, a habitat that is increasingly threatened by human development and conversion to cropland. This species shows some evidence of site philopatry, whereby birds return to their birthplaces to nest (Skipper 1998).

Habitat loss and degradation comprise the greatest threat to Grasshopper Sparrows. Much of the grassland habitat on which Grasshopper Sparrows are dependent for nesting and rearing their young has been converted to farmland or subject to other human development. Grasshopper Sparrows nest on the ground in grass fields and are vulnerable to predators and human disturbances. Disturbances during the breeding season, such as mowing or burning, have been shown to be detrimental to Grasshopper Sparrow populations (Dechant, et al. 2001). In arid western states, grazing has been shown to have a negative impact on Grasshopper Sparrows due to the removal of the essential litter layer required for nest construction and concealment (Bock and Webb 1984). Reduction of the litter layer exposes chicks and nests to increased predation.

In addition, nest parasitism by Brown-headed Cowbirds (*Molothrus ater*) has been well-documented as a significant threat to breeding Grasshopper Sparrows (Dechant et al. 2001).

Anticipated costs and savings. The cost of conserving Grasshopper Sparrows and thus avoiding federal listing would involve increasing funding to state and federal landowner incentive programs designed to conserve grassland habitat. The Conservation Reserve Program has provided financial incentives to private land owners who implement conservation practices on environmentally sensitive lands. Expanding CRP and similar state programs would aid in the successful recovery of Grasshopper Sparrows and would demonstrate the wildlife value of the CRP. Federal listing of Grasshopper Sparrows would economically impact cropland farming and grazing in northern Utah as well as some provisions of the CRP program, e.g., use of CRP lands for emergency grazing.

Rationale for proposed designation. Grasshopper Sparrows depend on dry grassland, a habitat subject to many threats (e.g., conversion to cropland, grazing by livestock, and urban encroachment). In the western states, Grasshopper Sparrows are estimated to have declined 7.9% annually for the last two decades and also show range-wide decline. For these reasons, the Grasshopper Sparrow is designated as a Species of Concern.

6.2 *Asio flammeus,* Short-eared Owl

Species status statement. The Short-eared Owl is found throughout most of North America and Eurasia, and is native to several island chains. In Utah, Short-eared Owls are distributed over most of the state, though they are less wide-spread today than historically. Distribution of this species has decreased markedly in its traditional range along the Wasatch Front in the last few decades (Behle et al. 1985).

Short-eared Owl populations have declined range-wide since 1966 (Sauer et al. 2001). Short-eared Owls first appeared on the National Audubon Society's Blue List of declining birds in 1976, and the species is currently listed as Threatened or Endangered in 7 of 13 northeastern states (Holt and Leasure 1993). The Canadian population of Short-eared Owls is estimated to have decreased 43% between 1966 and 1989 (NWT 2001). The Breeding Bird Survey indicates significant population declines in both the Western Region and Surveywide (Sauer et al. 2001).

Statement of habitat needs and threats for the species. The Short-eared Owl is an open country, ground-nesting species that occupies grasslands and tundra. Ground-nesting leaves Short-eared Owl chicks and adults vulnerable to a host of predators. Populations of Short-eared Owls are largely dependant on the abundance of small mammals, such as voles, for prey. This species may be nomadic in regions where fluctuations in prey base are considerable (Holt and Leasure 1993).

Habitat loss is the primary factor in Short-eared Owl population decline. Conversion of grasslands to agriculture has had a dramatic effect on available habitat and the prey base of Short-eared Owls. Ground-dwelling chicks are also susceptible to human activities associated with farming (NWT 2001). Predation on fledglings and eggs by skunks, cats, and dogs has also been documented (Melvin et al. 1989, Tate 1992). Accumulation of organochlorines and other harmful chemicals has been shown to occur at minimal levels. However, this bioaccumulation has not yet had a significant impact on eggshell thickness, tissue damage, or embryo mortality (Holt and Leasure 1993).

Anticipated costs and savings. Short-eared Owls play an ecological and economical role in controlling rodent outbreaks that impact grasslands. Costs associated with the conservation of this species would involve research on the cyclic nature of the species and its prey; some additional costs would be associated with restrictions on rodent poisoning and restoration of grassland habitats in some areas. Increases in state and federal landowner incentive programs (e.g., CRP) would also be involved. Federal listing of Short-eared Owls would likely impact grazing and other agricultural practices in areas throughout the state.

Rationale for proposed designation. Short-eared Owl populations have decreased range-wide since 1966. BBS data indicates significant population declines in both the Western Region and Surveywide. Short-eared Owl distribution has decreased in its historical range along the Wasatch Front. Conversion of native grasslands for agriculture threatens Short-eared Owl populations by reducing suitable habitat and by adversely affecting the available prey base. For these reasons, the Short-eared Owl is designated as a Species of Concern.

6.3 *Athene cunicularia*, Burrowing Owl

Species status statement. The Burrowing Owl occurs from southern portions of western Canada through the western United States and Mexico through Central America, and in South America to southern Argentina (Sheffield 1997, Haug et al. 1993). Burrowing Owls are widely distributed throughout Utah, though historically their distribution was more extensive than today (Behle et al. 1985).

Since the early 1900s, Burrowing Owls have experienced extensive population declines throughout most of their range. Breeding Bird Survey data indicate a positive population trend in the western region of the United States, possibly due to increased conservation efforts (Sauer et al. 2001). However, populations in North America are decreasing at a rate of 0.6% per year (Sheffield 1997) and the Utah population is less abundant than it was historically (Behle et al. 1985).

Statement of habitat needs and threats for the species. Burrowing Owls are obligate burrow nesters; they nest in ground burrows of prairie-dogs or other fossorial mammals. In Utah, Burrowing Owls are largely dependent upon prairie-dog colonies, which have experienced significant population declines throughout the state. Habitat fragmentation has led to isolated breeding populations of Burrowing Owls over much of their range. Gene flow between these populations and possible genetic uniqueness is currently being investigated (Grandison pers. comm.).

The primary reason for Burrowing Owl decline is destruction and modification of their habitat. Destruction of grasslands for the purposes of agriculture and other human development has impacted Burrowing Owl populations throughout much of Utah. The large-scale culling of prairie-dogs as agricultural pests has reduced the availability of suitable nesting sites and reduced foraging areas of Burrowing Owls. Exposure to insecticides, rodenticides, and other harmful chemicals have also been linked to Burrowing Owl mortality (Fox et al. 1989, Sheffield 1997, and James et al. 1990).

Anticipated costs and savings. Burrowing Owls help control large insect outbreaks such as grasshoppers. Conservation costs for this species would include protection of nesting colonies (including prairie-dog colonies), restrictions on pesticide applications in key nesting areas, and

avoidance of or mitigation for nest sites lost to urban developments or infrastructure (e.g., construction of artificial nest structures). Because Burrowing Owls often inhabit agricultural and urban areas, federal listing of this species would likely impact a variety of agricultural practices, as well as suburban and infrastructure development in several areas throughout the state.

Rationale for proposed designation. The Burrowing Owl is dependant on native grassland, a habitat increasingly threatened by human activities (e.g. conversion for agriculture, livestock grazing, and urban encroachment). This species is an obligate burrow nester and is largely dependant on the presence of prairie-dog colonies for suitable nest sites. Prairie-dog populations have undergone drastic declines throughout the state. Burrowing Owl populations are estimated to be declining in North America at a rate of 0.6% per year. In Utah, Burrowing Owls are less abundant than historically and statewide distribution has been significantly reduced. For these reasons, the Burrowing Owl is designated as a Species of Concern.

6.4 *Buteo regalis*, Ferruginous Hawk

Species status statement. Ferruginous Hawks breed in western North America, from southern Canada between the Great Plains and Rocky Mountain regions south to New Mexico (Olendorff 1993). Ferruginous Hawks are distributed throughout most of the state of Utah.

Productivity in Ferruginous Hawks is directly correlated with the available prey base. In many parts of Utah, Ferruginous Hawks rely very heavily on the availability of jack rabbits (*Lepus* spp.) for food. Due to the cyclic nature of jack rabbit populations, which are susceptible to boom and crash (Wagner and Stoddart 1972), Ferruginous Hawks may experience similar population crashes. In the absence of additional prey, such as ground squirrels or prairie-dogs, local Ferruginous Hawk populations may not recover from such a population decline (Woffinden and Murphy 1989).

Historically, Ferruginous Hawks have experienced severe population declines throughout most of their range. In central Utah, 16 breeding pairs of Ferruginous Hawks disappeared between 1972 and 1986 (Woffinden and Murphy 1989). Current studies of Ferruginous Hawks indicate that productivity and nest occupancy fluctuate widely in most of Utah and are currently insufficient to support a stable long-term population (Porter and Day 2001, Smith 2001).

Statement of habitat needs and threats for the species. Breeding Ferruginous Hawks rely on grassland or shrubsteppe terrain and, in many parts of Utah, nest on the ecotone between these habitats and pinyon-juniper woodlands (Parrish et al. 1999). These habitat types have all undergone substantial change within recent years due to human development and other anthropogenic factors.

Threats to Ferruginous Hawks in Utah include habitat destruction, loss of prey base, and human intrusion during breeding (Parrish et al. 1999). Conversion of Ferruginous Hawk habitat for agriculture and grazing purposes, and loss of suitable nesting sites has had a significant negative impact on Ferruginous Hawk populations. Reduction in prey abundance has also contributed to population declines, resulting in extirpation from local areas. Ferruginous Hawks are highly sensitive to human intrusion during breeding, which may result in nest abandonment and reproductive failure (Woffinden and Murphy 1989, Olendorff 1993).

Anticipated costs and savings. Ferruginous Hawks are charismatic raptors sought after by wildlife watchers in the West. They also help control lagomorph (e.g., rabbits), prairie-dog, and ground squirrel populations. Conservation costs for this species would involve reducing or mitigating for loss of habitat to oil and gas development and vegetation removal (e.g., pinyon-juniper chaining) projects; protection of nest sites from human disturbance during the breeding season would also involve enforcement and signing costs. Ferruginous Hawks inhabit several areas that are currently undergoing or will soon be undergoing oil and gas development. Thus, federal listing of this species would likely have a significant impact on oil and gas development in the Uinta Basin and Castle Valley areas and would also impact a variety of activities on Bureau of Land Management lands in western Utah.

Rationale for proposed designation. Ferruginous Hawk populations have experienced substantial declines throughout most of their range. In Utah, 16 breeding pairs have disappeared since 1972 and extirpation of Ferruginous Hawks from local areas has occurred. Current estimates indicate that Ferruginous Hawk productivity in Utah is insufficient to support stable long-term populations. Threats to Ferruginous Hawk populations include habitat destruction, loss of prey base, and human intrusion during breeding. For these reasons, the Ferruginous Hawk is designated as a Species of Concern.

6.5 *Centrocercus urophasianus*, Greater Sage-grouse

Species status statement. Sage-grouse once inhabited sagebrush rangelands in 16 states and three Canadian Provinces. Currently, populations exist in 10 states and 1 province (Connelly and Braun 1997). Beck and Mitchell (1997) estimated that Greater Sage-grouse in Utah occupy only 50% of the habitat they once did and are one-half as abundant as they were prior to 1850. Currently, the largest populations of Greater Sage-grouse in Utah are found in western Box Elder County, on Blue and Diamond Mountains (Uintah County), Rich County, and on Parker Mountain (Wayne County). Smaller populations are found scattered in the central and southern portions of the state.

Greater Sage-grouse have continued to decline throughout much of the western United States despite over seventy years of research and conservation efforts. Strawberry Valley in central Utah is a dramatic example of the decline of Greater Sage-grouse in Utah. In the 1930s, Griner (1939) estimated that 3,000-4,000 Greater Sage-grouse inhabited this high mountain valley. Bunnell et al. (2000) estimated the population in the Strawberry Valley to be 250-350 grouse in 1999, representing a population decrease of 88-94% (UDWR 2002a). In the state of Utah, the average number of males counted annually per lek has steadily declined from 1967 to 2001 (UDWR 2002a).

Statement of habitat needs and threats for the species. Greater Sage-grouse are ground nesters and are susceptible to a variety of native and non-native predators. Compared to other species of upland game birds, Greater Sage-grouse clutch-size is extremely variable (average clutch size may range from 6.0 to 9.5 eggs) and relatively low (Schroeder 1997), making them less able to recover from population declines (UDWR 2002a).

Sage-grouse use the same breeding grounds or “leks” for several consecutive breeding seasons. Females often return to the same nesting area each year and may even use the same nest site. Extensive habitat loss and modification has coincided with declining populations. Reasons for habitat loss are varied and include catastrophic wildfire, urban expansion, agricultural conversion, herbicide treatments, rangeland seeding, juniper expansion, and livestock grazing management (UDWR 2002a). The increase in urban development has also contributed to an increase in non-native predators (Connelly et al. 1991).

Anticipated costs and savings. Greater Sage-grouse are economically important as both a harvested and watchable wildlife species. This species is also considered the flagship for shrubsteppe (sagebrush/grassland a.k.a. rangeland) ecosystem management and conservation. Conservation costs for this species include changes in land use management by private, state, and federal land owners designed to enhance sage-grouse habitat, as well as habitat restoration in shrubsteppe areas. Federal listing of Greater Sage-grouse would severely impact hunting as well as agricultural practices, urban development, and oil and gas development in several areas throughout the state.

Rationale for proposed designation. Greater Sage-grouse in Utah occupy an estimated 50% of their historic distribution with a corresponding decrease in abundance. The average number of males counted annually per lek has steadily declined from 1967. Extensive loss of habitat due to a variety of anthropogenic factors, including urban expansion, agricultural conversion, herbicide treatments, rangeland seeding, and livestock grazing, has coincided with declining populations. For these reasons, the Greater Sage-grouse is designated as a Species of Concern.

6.6 *Charadrius montanus,* Mountain Plover

Species status statement. Mountain Plovers breed in scattered localities from extreme southern Alberta and northern Montana south to central and southeastern New Mexico, western Texas, western Oklahoma, and western Missouri (Degraaf and Rappole 1995). In Utah, the Mountain Plover has been recorded as a casual migrant in Box Elder, Weber, Salt Lake, and Dagget counties (Woodbury et al. 1949). Breeding Mountain Plovers have been documented in Duchesne and Uintah counties (Day 1994, Manning and White 2001). Breeding populations of Mountain Plovers are somewhat fragmented throughout the west. Utah populations are discontinuous from breeding populations in neighboring states (Manning and White 2001).

Mountain Plovers have exhibited population declines range-wide and in the BBS western region since the 1960s (Sauer et al. 2001). Survey summaries for Utah indicate the total number of Mountain Plovers observed for the state has drastically declined since 1993. In 1993, a total of 31 Mountain Plovers were recorded including 15 young/sub-adults. By 1999, the breeding population was reduced by more than half with only three young produced. By 2002, surveys yielded no sightings of the Mountain Plover in its historical range despite intensive survey efforts

(Parrish et al. 2002). In 2003, only one Mountain Plover was reported in its historical breeding range.

Statement of habitat needs and threats for the species. The Mountain Plover is dependant on shortgrass prairie habitat, comprised primarily of blue grama (*Bouteloua gracilis*) and buffalo grass (*Buchloe dactyloides*) (Graul 1975). Habitat alteration from anthropogenic factors and removal of primary native grazers represents the greatest threats to the Mountain Plover (Knopf 1994). The rangewide decline of the Mountain Plover has been correlated to the disappearance of bison and conversion of shortgrass prairie to cropland. Breeding areas of the Mountain Plover in Utah occur in regions that are heavily disturbed by oil and gas development. Additional development, which would impact these important breeding areas, has recently been proposed (Parrish et al. 2002). Bioaccumulation of organochlorines, such as DDE, represents a potential threat to Mountain Plover populations. In a study conducted by Knopf et al. (1992), analysis of 25 adults and 22 eggs showed DDE levels from 1-10 ppm in both birds and eggs. Similar levels of DDE accumulation have been shown to precipitate reproductive failure in Bald Eagles, Ospreys, and several species of wading birds (Knopf et al. 1992). Because the Utah breeding population is extremely small, reproductive failure and demographic stochasticity would have important implications for population viability.

Anticipated costs and savings. The cost of conserving the Mountain Plover and thus avoiding federal listing would involve mitigation of habitat loss due to oil and gas development and protection of nesting sites during the breeding period (April through June). Federal listing of this species would fiscally impact agricultural interests as well as oil and gas development in the Uintah Basin.

Rationale for proposed designation. Mountain Plovers depend on shortgrass prairie, a habitat subject to many threats (e.g., conversion to cropland and energy development). The Utah population of Mountain Plovers is considered to be peripheral to the distribution of the species in neighboring states, which leaves the Utah Mountain Plover vulnerable to genetic and demographic stochasticity. Breeding Bird Survey data indicate that Mountain Plovers are in decline throughout their range. Mountain Plover numbers in Utah have drastically declined since 1993. Survey efforts in 2002 indicate that the Mountain Plover has all but disappeared from its

historic range in Utah. For these reasons, the Mountain Plover is designated as a Species of Concern.

6.7 *Cypseloides niger,* Black Swift

Species status statement. Black Swifts occur in the mountainous and coastal regions of the western United States and Canada. In Utah, Black Swifts occur in only three confirmed breeding areas: Bridal Veil Falls, Aspen Grove (Knorr 1962), and Stewart Falls (M. Webb pers. comm.). Other potential breeding sites that meet the habitat requirements for Black Swifts occur throughout the state, but breeding at these locations has not yet been confirmed (Parrish et al. 1999). This species generally lays only one egg, and nestling development occurs over a period of 45-49 days, a developmental period uncharacteristic of birds their size (Ehrlich et al. 1988). The energy expenditure per offspring in Black Swifts is very high.

A comprehensive survey of Black Swifts in Utah has not yet been completed. The Utah population may be too small to accurately predict population trends, however, this species appears to be declining throughout its range at a rate of about 6% per year over the last 30 years (Sauer et al. 2001).

Statement of habitat needs and threats for the species. Black Swifts are closely associated with waterfalls in Colorado and Utah. This species nests behind or in the spray of waterfalls that occur from 6,000 to 11,500 feet in elevation. Black Swifts are colonial nesters and may nest in groups of ≤10 pairs (Knorr 1961, 1962). Foraging flocks, often associated with swallows or other swifts, may occur several miles from the nest site. Black Swifts are aerial insectivores and feed exclusively on aerial insects. This species is one of the latest migrants to Utah, with a breeding period that may extend into early September (Parrish et al. 1999).

Because of their nest-site location, the risk of predation or nest parasitism is low. However, significant impacts to the water flow or water quality upstream of nest sites would be detrimental to breeding birds. Drought or over-allocation of water could have a dramatic effect on nesting Black Swifts by reducing the size and number of waterfalls suitable for nesting. Pesticide use in mountain riparian habitats may also have a detrimental effect on Black Swift nestlings and adults by reducing the availability of insect prey and by possible bioaccumulation of harmful toxins (Parrish et al. 1999).

Anticipated costs and savings. Black Swifts are not likely to seriously impact Utah economics. They are a sought after watchable wildlife species that inhabit popular recreation destinations, i.e., waterfalls. Conservation costs would involve inventory and monitoring of populations and research into foraging area use as well as protection or restoration of flow to nesting area waterfalls. Federal listing may have a limited impact on recreation activities and water distribution in the Sundance and Provo Canyon areas and other areas where Black Swifts are found.

Rationale for proposed designation. Black Swifts are extremely rare in Utah; they occur in only three confirmed locations in the state. The low reproductive potential and high energy expenditure per offspring of this species contributes to its lessened ability to cope with catastrophic events and periods of high mortality. Drought or over-allocation of water in Black Swift habitat may adversely affect this species by reducing the size and number of waterfalls suitable for nesting. Pesticide use in mountain riparian habitats may also adversely affect Black Swift populations by reducing availability of insect prey and possible bioaccumulation of toxins. For these reasons, the Black Swift is designated as a Species of Concern.

6.8 *Dolichonyx oryzivorus*, Bobolink

Species status statement. The Bobolink's breeding range is an east-west band across the northern U.S. and southern Canada between the 50th and 39th parallels. Their distribution is fairly continuous in the East but patchy in the West. Isolated breeding populations occur in northern Utah and Nevada, central Washington, and southeastern Arizona (Martin and Gavin 1995). In Utah, Bobolinks occur in low abundance in isolated groups, primarily in the northern half of the state (Parrish et al. 1999).

Bobolink populations are declining at a significant rate (1.6% per year) across their range (Sauer et al. 2001). They show the same average annual decline (1.6%) in the western U.S.; however, this rate is not significant. Anecdotal evidence from historical accounts indicates that Bobolink populations in Utah have declined. Bobolinks were historically common in northern Utah; Hayward et al. (1976) indicated that "all of the early investigators visiting Utah prior to the turn of the century found this bird present and in considerable numbers." Bobolinks are now considered to be rare (Walters and Sorensen 1983) and somewhat erratic, probably not occurring during drought periods (Behle et al. 1985).

Statement of habitat needs and threats for the species. Bobolinks have one of the longest annual migrations of any North American songbird. These Neotropical migrants travel about 20,000 km (12,500 mi) from their North American breeding grounds to their "wintering" grounds in southern South America. Bobolinks spend approximately half of each year in migration; they typically arrive in Utah in early to mid May and probably begin southerly migration around mid August, though some birds may still be present through September (Behle and Perry 1975).

Bobolink breeding is restricted to wet meadow and flooded pasture habitats. Wet meadow habitats have decreased and been fragmented in Utah because of agricultural encroachment, urban encroachment, road development, water development (reservoirs and in-stream flow depletions) and stream channelization. Hay fields (primarily grasses with little or no alfalfa/legumes), particularly those that are irrigated or flooded, can provide suitable breeding habitats. Bobolink success in these habitats depends primarily on the timing of hay cutting. Hay cutting during the incubation or nestling period may cause direct destruction, abandonment, or predation of all nests in an area (Bollinger et al. 1990).

Nest parasitism by Brown-headed Cowbirds is considered to be uncommon but varies greatly by site (0-43% of nests parasitized). Nesting Bobolinks, which feed their young exclusively invertebrates, are likely to be exposed to a number of pesticides because of their insectivorous foraging behavior and proximity to agricultural areas on the breeding, migration, and wintering grounds.

Anticipated costs and savings. Since Bobolinks often inhabit areas used for agricultural purposes, e.g., wet meadows, wet pastures, and flooded fields, federal listing would likely impact grazing, pesticide application, and hay production in portions of northern and central Utah. Conservation costs to avoid listing would come from delaying mowing and grazing in Bobolink nesting areas to avoid the nesting season; costs associated with protection and restoration of wet meadow habitats and reductions in insecticide applications would also be involved. Bobolinks are popular with birders and currently provide limited economic benefits to areas such as Heber City.

Rationale for proposed designation. In Utah, Bobolinks occur in low abundance in isolated groups. This species is estimated to be declining at a rate of 1.6% annually throughout

their range. Breeding in Bobolink populations is limited to wet meadow habitats. These areas have become decreased and fragmented due to agricultural development, urban encroachment, road development, creation of reservoirs, and stream channelization. Breeding success and juvenile recruitment may be adversely affected by hay cutting or mowing during the incubation or nestling period. These activities may cause direct destruction, abandonment, or predation of all nests in an area. Nest parasitism by Brown-headed Cowbirds has also been documented in some areas. For these reasons, the Bobolink is designated as a Species of Concern.

6.9 *Falco peregrinus*, Peregrine Falcon

Species status statement. In Utah, Peregrine Falcon breeding sites occur in the Utah Mountain (i.e., Wasatch and Uinta Mountains), Basin and Range, Mojave, and Colorado Plateau ecoregions. The largest concentrations are along the Colorado River (including Lake Powell) and its tributaries in the southeastern portion of the state. The historic distribution of the Peregrine Falcon along the Wasatch Front is well documented (Porter and White 1973), and the current distribution here is more limited than in the past (F. Howe unpubl. data). Historic distribution in southern Utah is less well understood; Peregrine Falcons appear to have expanded in southern Utah, though some of the expansion likely represents the discovery of previously unknown nesting areas (F. Howe pers. comm.).

Peregrine Falcon populations declined dramatically from the 1940s to the1960s. Much of the decline can be attributed to the effects of pesticide residues (particularly residues of organochlorines such as DDT), which caused egg shell thinning and led to decreased productivity. Other factors that probably contributed to the population decline include climatic change (long-term drying of wetlands), botulism, and human disturbance (shooting, nest site disturbance, etc.; Porter and White 1973, Craig et al. 1984).

Peregrine Falcon populations have rebounded since the late 1960s, particularly after 1985. This population recovery has been so dramatic that the species has recently been removed from the federal threatened and endangered species list (USFWS 1999). In southern Utah, the number of nesting Peregrine Falcons has increased greatly. In contrast, the central and northern Utah Peregrine Falcon populations have not rebounded; pairs have not reoccupied historic nest sites and productivity is almost entirely restricted to artificially maintained nesting towers (F. Howe pers. comm.).

Statement of habitat needs and threats for the species. Peregrine Falcons nest on tall cliffs (usually below 6000 ft elevation) near and often directly above streams, rivers, or reservoirs, though some sites can be several miles from water. Nests are placed in cracks, holes, and small caves on cliff faces. Peregrine Falcons forage on a variety of birds that are associated with open water, streamside, wetland, cliff, and open meadow habitats; typical prey items include waterfowl, shorebirds, doves, swallows, swifts, and meadowlarks (Porter and White 1973).

Although the population has rebounded, several threats still exist to the Peregrine Falcon in Utah. The primary threat is loss of foraging habitat and disturbance of nest sites associated with urban encroachment along the Wasatch Front. Also, increased outdoor recreation poses a potential threat to nest sites even in remote locations of Utah. Outbreaks of botulism (a disease which can cause adult mortality) regularly occur in the state's wetlands, particularly around the Great Salt Lake. And, although the use of organochlorines has been banned on the breeding grounds, Peregrine Falcons are exposed to a variety of pesticides, including organochlorines, on their wintering grounds (west Mexico and possibly portions of South America). Several pesticides are used on breeding season foraging areas, and their influence on Peregrine Falcon productivity is not well understood.

Anticipated costs and savings. The Peregrine Falcon is perhaps the highest profile "success story" for recovering and delisting a federal endangered species. It is a widely recognized bird, popular with wildlife watchers, and its status is still closely scrutinized by the public. Conservation costs would be limited to continued population monitoring and reduction of human disturbance at nest sites. Relisting of the Peregrine Falcon would impact oil and gas development in many parts of the state and would also impact a variety of recreational activities throughout the state.

Rationale for proposed designation. Peregrine Falcon populations declined dramatically from the 1940s to the 1960s. These population declines were large attributed to organochlorines such as DDT. Although Peregrine Falcon populations are on the rebound, many threats to their populations still persist (e.g., pesticide use on wintering grounds, loss of foraging habitat, disturbance of nesting sites, and urban encroachment). Current Peregrine Falcon distribution along the Wasatch Front is still less than the historic distribution. In central and northern Utah,

many historic nest sites remain unoccupied and populations have not rebounded. For these reasons, the Peregrine Falcon is designated as a Species of Concern.

6.10 *Melanerpes lewis*, Lewis's Woodpecker

Species status statement. Lewis's Woodpecker breeds from southern British Columbia to southwestern South Dakota and northwestern Nebraska, to south-central California, Utah, southern New Mexico, and eastern Colorado (Parrish et al. 1999, DeGraaf et al. 1991). Throughout the western United States, the distribution of Lewis's Woodpecker is spotty and somewhat discontinuous (Sauer et al. 2001, Peterson 1990). In Utah, the distribution of Lewis's Woodpecker is concentrated in the northeastern, southeastern, and southwestern regions of the state, with a small number occurring in the northwestern corner of the state (Walters and Sorenson 1983, Sauer et al. 2001). Utah represents a substantial portion of the overall range of Lewis's Woodpecker.

Lewis's Woodpecker is an uncommon permanent resident in Utah, though it is much less common today than historically (Behle et al. 1985). Lewis's Woodpecker has been functionally extirpated from much of it historical breeding range along the Wasatch Front. The Breeding Bird Survey population trend data for the Lewis's Woodpecker are inconclusive, however, the short duration of the Breeding Bird Survey (31 years) may fail to capture long-term trends associated with this species (Sauer et al. 2001, U.S. Forest Service 1991).

Statement of habitat needs and threats for the species. Lewis's Woodpecker is a habitat specialist with primary breeding habitat in ponderosa pine and open riparian areas. Winter habitat includes open woodlands and lowland riparian areas (Parrish et al. 1999). Lewis's Woodpecker is a cavity nester which nests in dead or dying trees, often using previously excavated holes (U.S. Forest Service 1991). This species requires large open pine forests with adequate spacing between trees to allow for foraging (DeGraaf et al. 1991). The diet of the Lewis's Woodpecker is primarily composed of insect prey during the breeding season and nuts and berries during the fall and winter.

Because of fire suppression efforts over the last century, densities of ponderosa pine and mixed conifer forests have increased, decreasing available foraging areas for Lewis's Woodpeckers and increasing the risk of catastrophic wildfire (Parrish et al. 1999). Overgrazing

in riparian areas has removed essential ground cover necessary to support insect prey. In addition, competition for nesting cavities by European Starlings (*Sturnus vulgaris*), a species largely associated with human disturbance and cattle grazing, has had significant negative impact on Lewis's Woodpecker populations (Parrish et al. 1999).

Anticipated costs and savings. Lewis's Woodpeckers help control large insect outbreaks in forest and riparian habitats. Because Lewis's Woodpeckers inhabit riparian, ponderosa pine, and lodgepole pine habitats, federal listing would impact water distribution, as well as timber harvest and recreation in several areas around the state. Conservation costs would include inventory and monitoring, riparian restoration, and some changes in timber harvest practices (e.g., increased harvest of small diameter trees).

Rationale for proposed designation. Utah represents a substantial portion of the overall distribution of Lewis's Woodpecker. This species has been extirpated from much of its historical breeding range along the Wasatch Front. Lewis's Woodpecker is a habitat specialist with primary breeding habitat in ponderosa pine and open riparian areas. Lewis's Woodpecker habitat in ponderosa pine is threatened by fire suppression efforts, logging, and harvesting of dead snags. Riparian habitat is threatened by a variety of activities, including overgrazing, urban encroachment, water depletion, and agricultural encroachment among others. For these reasons, Lewis's Woodpecker is designated a Species of Concern.

6.11 *Numenius americanus*, Long-billed Curlew

Species status statement. Long-billed Curlews breed from south-central British Columbia, southern Alberta, southern Saskatchewan, and southern Manitoba south to east-central California, central Nevada, central Utah, central New Mexico, and northern Texas, and east to southwestern North Dakota, northwestern South Dakota, north-central Nebraska, and southwestern Kansas (Parrish et al. 1999). Much of their distribution is spotty and discontinuous (Sauer et al. 2001). Uncultivated rangeland and pastures support most of the population of Long-billed Curlews in the United States (Johnsgard 1981). The Great Basin comprises a significant portion of their overall range and has been described as an area of great importance in maintaining breeding populations of Long-billed Curlews (Haig and Oring 1998). In Utah, Long-billed Curlews occur most often in the northern and central valleys; the Great Salt Lake is a major breeding site in the state (Parrish et al. 1999).

Long-billed Curlews have experienced dramatic population declines in the last century (Johnsgard 1981) and breeding populations of Long-billed Curlews in Utah have substantially diminished (Hayward et al. 1976). According to Breeding Bird Survey data, Long-billed Curlews have been decreasing rangewide at a rate of 1.2% per year for the past 30 years (Sauer et al. 2001).

Statement of habitat needs and threats for the species. Long-billed Curlews nest in dry grasslands where sufficient cover and abundant prey exist (Pampush 1980). This species nests on the ground and is vulnerable to predation and human disturbance. Long-billed Curlews are monogamous and lay only one clutch of about four eggs per breeding season (Redmond and Jenni 1986). Male Long-billed Curlews are natal site philopatric (birds return to their birthplaces to nest), though they do not attempt to breed until 3 years of age (Redmond and Jenni 1982).

Loss of breeding habitat and habitat modification are the greatest threats to Long-billed Curlews. Large portions of breeding habitat on the east side of the Great Salt Lake have been lost due to housing development. Predation by red foxes *(Vulpes vulpes)* also represents a significant threat to Long-billed Curlews. Habitat fragmentation has provided predators with travel corridors, which increases predation upon ground-nesting birds (Parrish et al. 1999).

Anticipated costs and savings. Long-billed Curlews rely on both grassland and wetland habitats, particularly those in the Great Salt Lake ecosystem. The Great Salt Lake is a nationally recognized birding destination; tourists interested in the Great Salt Lake contribute to the economies of all of the counties around the lake. Conservation costs would include wetland protection and protection of nesting colonies. Federal listing of the Long-billed Curlew could impact grassland agricultural practices, water distribution, urban development, and some forms of recreation; this would be primarily in the Great Salt Lake and Provo Lake areas, but would extend to several rural areas along the Wasatch Front.

Rationale for proposed designation. The Great Basin comprises a significant portion of the overall distribution of the Long-billed Curlew. The Great Salt Lake is a major breeding area for this species. Long-billed Curlew's have experienced dramatic population declines in the last century. BBS data estimate the Long-billed Curlew to be decreasing at a rate of 1.2% annually for the last 30 years. Loss of breeding habitat and habitat modification comprise the greatest threats to the viability of the species. Large portions of Long-billed Curlew breeding habitat on

the east side of the Great Salt Lake have been lost because of urban encroachment. For these reasons, the Long-billed Curlew is designated as a Species of Concern.

6.12 *Pelecanus erythrorhynchos,* American White Pelican

Species status statement. Utah represents a critical breeding region for the American White Pelican. Historically, this species nested in several areas of the Utah Lake/Great Salt Lake ecological complex (Goodwin 1904). Today, only Gunnison Island persists as a colonial nesting site for American White Pelicans in Utah. This colonial nesting site currently ranks as one of the largest breeding colonies in North America (Parrish et al. 1999).

In 1933, it was found that seven important breeding colonies of American White Pelicans were present in North America (Thompson 1933). Of these seven colonies, only four were found to be viable in 1966 (Lies and Behle 1966). The remainder were compromised by water diversion or human disturbance. In the last three decades, only the Gunnison Island colony has shown a positive population trend (Parrish et al. 1999).

Statement of habitat needs and threats for the species. American White Pelicans are extremely social birds and nest colonially in suitable areas. Colonial nest sites are usually located on small islands with low gradient slopes to allow aerial access to the nest (Knopf 1979). This species lays only two eggs, with predation having a significant impact on fledgling survival. Incubation occurs over a period of 30 days and both adults feed and care for the young until they are about three weeks old.

As previously mentioned, all of Utah's breeding American White Pelicans are located on Gunnison Island in the north arm of the Great Salt Lake, which makes them potentially susceptible to disturbance and environmental change. Breeding American White Pelicans from Utah likely overwinter in Mexico and are subject to long flights between breeding and wintering ranges.

Nesting colonies of American White Pelicans are extremely sensitive to disturbance; pelicans have been known to abandon entire nesting colonies subsequent to human disturbance. Human disturbance can also increase incidence of predation by forcing adults off nests, leaving nests vulnerable to gulls and other predators (Parrish et al. 1999). Modification or reduction of important foraging areas, such as the Bear River Bay, represents another potential threat to

American White Pelicans in Utah. Such areas support large numbers of migratory pelicans and supply much of the food necessary to support the Gunnison Island breeding colony (Parrish et al. 1999).

Anticipated costs and savings. Currently, the American White Pelican nesting colony on Gunnison Island is protected from human disturbance and additional costs for colony protection (e.g., enforcement, predator fencing) would be relatively low. Pelicans have a minor economic impact on private fish ponds; pond operators are faced with losing fish or installing deterrents. Conservation costs would include ensuring water supply to important foraging areas (e.g., Bear River Bay). Federal listing may impact water distribution, as well as private and public fisheries, and could potentially impact salt and brine shrimp harvest in the north arm of Great Salt Lake.

Rationale for proposed designation. Utah represents a critical breeding area for the American White Pelican. The breeding colony on Gunnison Island is one of only four breeding colonies in North America, and the only one remaining in the Great Salt Lake complex. American White Pelicans have a relatively low reproductive potential, contributing to the inability of the species to cope with catastrophic events or periods of high mortality. Nesting American White Pelicans are extremely sensitive to disturbance. Human intrusion during the incubation or nesting period may result in the abandonment of the entire colony. Modification of important foraging areas may threaten American White Pelicans by reducing the available prey base. For these reasons, the American White Pelican is designated as a Species of Concern.

6.13 *Picoides tridactylus*, Three-toed Woodpecker

Species status statement. In North America, the Three-toed Woodpecker occurs from northern Alaska east to Newfoundland and south locally in mountains to Oregon, Nevada, New Mexico, South Dakota, Minnesota, Michigan, New York, and northern New England (Arizona Partners in Flight 1999). In Utah, the Three-toed Woodpecker is a permanent resident of coniferous forests above 8,000 feet; it is fairly easily observed in the Uinta Mountains and in areas of the Cedar Breaks National Forest, but is less commonly observed elsewhere (Parrish et al. 1999, Behle et al. 1985). A large portion of the breeding range of Three-toed Woodpeckers occurs in Utah, and Utah has been proposed as an important region in maintaining healthy populations of Three-toed Woodpeckers (Parrish et al. 1999).

Population trends of the Three-toed Woodpecker are difficult to track due to their eruptive behavior. This species may be very common in areas associated with spruce bark beetle infestations and may nest in loose colonies (Ehrlich et al. 1988, Stokes 1996). Populations of Three-toed Woodpeckers have been shown to increase as much as 85 fold during Engelmann spruce beetle outbreaks (Koplin 1969), and these periodic fluctuations in population size may maintain the vitality of the species (Goggans et al. 1988). In areas of low prey abundance this species may be quite rare.

Statement of habitat needs and threats for the species. Three-toed Woodpeckers are dependant upon coniferous forests with a significant percentage of dead trees for foraging and nesting. Three-toed Woodpeckers are closely associated with infestations of wood-boring insects, such as spruce bark beetles, and play an important role in controlling such insect outbreaks (Koplin 1972). In areas of abundant prey, Three-toed Woodpeckers may nest in loose colonies. This woodpecker exhibits strong breeding site tenacity and pair bonds may be maintained for several successive years (Ehrlich et al. 1988).

Because of the dependence of Three-toed Woodpeckers upon snags for feeding and nesting, activities that remove or eliminate this forest component are detrimental to populations of Three-toed Woodpeckers (Spahr et al. 1991). Salvage logging in regions of beetle infestation may remove essential nesting sites and reduce important foraging habitat (Murphy and Lehnhausen 1998). Fire suppression that eliminates fire-killed trees and increases the risk of catastrophic wildfire also poses a threat to this species (Parrish et al. 1999, Spahr et al. 1991).

Anticipated costs and savings. Three-toed Woodpeckers may help control outbreaks of forest insects such as pine bark beetles and spruce budworms. Because Three-toed Woodpeckers inhabit coniferous forests, federal listing would impact timber harvest and recreation in several forests around the state. Conservation costs to avoid federal listing might involve modifying some salvage logging practices (e.g., delaying salvage logging for three years after fire), as well as modifying management of fires and insect infestations in Utah forests.

Rationale for proposed designation. Utah represents a large portion of the overall breeding range of the Three-toed Woodpecker and Utah has been proposed as an important region in maintaining healthy populations of the species. Three-toed Woodpeckers are dependant upon coniferous forest, a habitat that is threatened by logging, snag removal, and

catastrophic fire. For these reasons, the Three-toed Woodpecker is designated as a Species of Concern.

6.14 *Tympanuchus phasianellus,* Sharp-tailed Grouse

Species status statement. Historically, Sharp-tailed Grouse occurred in sagebrush/native bunchgrass habitat throughout the intermountain region, extending from British Columbia, Washington, Idaho, and Montana south through portions of Oregon, California, Nevada, Wyoming, Colorado, New Mexico, and Utah. Currently, Sharp-tailed Grouse occur in only 5% of their historic range-wide distribution and 4% of their historic Utah distribution (UDWR 2002b, Bart 2000).

Sharp-tailed Grouse have experienced severe population declines rangewide since the late 1800s. Sharp-tailed Grouse were reportedly very abundant in areas of suitable habitat as late as 1919 (UDWR 2002b, Hart et al. 1950). Reportedly, thousands of Sharp-tailed Grouse could be seen in a day (Hart et al. 1950). By 1935, however, populations of Sharp-tailed Grouse plummeted. The total fall population of Sharp-tailed Grouse in Utah in 1935 was estimated at 1,500 birds (Hart et al. 1950). Populations remained low until the 1970s when more birds began to be sighted. With the introduction of the Conservation Reserve Program in 1987, the status of Sharp-tailed Grouse improved substantially. Surveys conducted in 1998-1999, estimated the total fall 1999 population at 10,782 birds (UDWR 2002b). Despite the recent population increase in Utah, Breeding Bird Survey data for the past 30 years indicate large, statistically significant population declines throughout the Western Region (Sauer et al. 2001

Statement of habitat needs and threats for the species. Sharp-tailed Grouse begin congregating at dancing grounds, or "leks," in early March. If suitable habitat is available, most females will nest within 2 km (1.2 mi) of the lek site (UDWR 2002b). Renesting may occur if the nest is depredated, however a hen will only raise one brood per breeding season (Johnsgard 1973). During spring and summer, Sharp-tailed Grouse occupy areas of dense forbs and sparse grass cover. Adults feed primarily upon succulent plants, whereas juveniles rely heavily on insect prey, primarily grasshoppers. Winter habitat comprises mountain shrub and riparian areas, and food sources include berries, fruits, and buds of native and non-native shrubs (UDWR 2002b).

The primary threat to Sharp-tailed Grouse populations is loss and degradation of native habitat. Large-scale conversion of shrubsteppe and grassland ecosystems for agricultural purposes, increased human development, and changes in land use have severely reduced available Sharp-tailed Grouse habitat. Overgrazing by livestock and monotypic re-seeding has degraded the quality of available habitat and reduced native plant diversity (UDWR 2002b).

Predation, hunting, and human disturbance during biologically critical periods also comprise substantial threats to Sharp-tailed Grouse populations (UDWR 2002b).

Anticipated costs and savings. Sharp-tailed Grouse are a harvested species in Utah; successful recovery of this species would increase hunting and viewing opportunities and demonstrate the wildlife value of CRP lands. Conservation costs would include habitat management and reduction of human disturbance in breeding areas. Federal listing of the Sharp-tailed Grouse would impact hunting, cropland farming, grazing, and some recreation in northern Utah, as well as some provisions (e.g., emergency grazing) of the CRP program.

Rationale for proposed designation. Sharp-tailed Grouse currently occur in only 5% of their historic range-wide distribution and 4% of their historic distribution in Utah. Sharp-tailed Grouse have experienced range-wide population declines in the last century. BBS data for the Western Region indicate large population declines for the last 30 years. Threats to the Sharp-tailed Grouse include loss and degradation of native habitat by conversion for agriculture, human development, and livestock grazing. For these reasons, the Sharp-tailed Grouse is designated as a Species of Concern.

7. Class: Mammalia, Mammals

7.1 *Sorex preblei,* Preble's shrew

Species status statement. The distribution of *Sorex preblei* includes the western states of Washington, Oregon, Idaho, Montana, California, Nevada, Colorado, and Utah. Records also exist of Pleistocene deposits from southern New Mexico and southern British Columbia (Nagorsen et al. 2001, Kirkeland and Findley 1996, Tomasi and Hoffman 1984, Cornely et al. 1992). Preble's shrew is one of the most rarely encountered mammals in Utah. Four specimens have been recorded for Utah, comprising three individuals from Timpie Springs (Tomasi and Hoffman 1984) and one individual from Horseshoe Springs (Pritchett and Pederson1993). This species is typically poorly represented in surveys, suggesting that populations are characteristically sparse. For example, during a study conducted in southwestern Wyoming for 7 years, only 7 Preble's shrews were captured in over 300,000 trap-days (Kirkland et al. 1997). Intensive efforts may be required to adequately determine population densities of this species.

Statement of habitat needs and threats to the species. Preble's shrew is found in arid and semi-arid habitats and is generally associated with bogs, marshes, and riparian areas (Cornely et al. 1992). Due to this species' usage of wetland habitats, including springs, marshes, bogs, and riparian areas, substantial threats to its survival exist. Wetland areas are considered to be among the most threatened habitat areas in Utah. Lowland riparian areas occupy only 0.23% (317 mi^2) of the total area of the state and are subject to a host of disturbances including dewatering, livestock trampling, pollution from pesticides, and agricultural runoff (Parrish et al. 1999).

Anticipated costs and savings. Conservation of Preble's shrew will require additional efforts to document the species' distribution and status throughout Utah's wetlands, and subsequent conservation measures that protect occupied habitats. This will likely involve intensive efforts to sample representative wetland habitats to detect the presence of Preble's shrew, followed by periodic monitoring of population trends. Given the rarity of this species and its dependence upon wetlands, conservation programs will likely focus on maintaining adequate wetland habitat in Utah. State habitat conservation may involve conservation easements, land purchases, and cooperative programs to manage water, grazing, and mining, and/or landowner incentives to maintain occupied habitat. Failure of these state-driven programs may result in

federal listing under ESA, resulting in greater restrictions on land and water use and subsequent negative impacts on local and state economies.

Rationale for proposed designation. The Preble's shrew is one of the rarest mammals in the state of Utah. Its distribution is limited in the West Desert region. The Preble's shrew requires desert wetlands to survive. These habitats are severely limited and threatened by dewatering, livestock trampling, and pollution from pesticides and agricultural runoff. For these reasons, the Preble's shrew is designated as a Species of Concern.

7.2 *Corynorhinus townsendii,* Townsend's big-eared bat

Species status statement. Townsend's big-eared bat occurs in scattered localities throughout the state at elevations below 9,000 ft. The distribution of the species is correlated with the availability of caves and abandoned mines. Although buildings are occasionally used, the majority of roosts--most day roosts, maternity sites, and hibernacula—are situated in caves or mines. Foraging and seasonal movements are minimal, and most populations are localized near roost sites.

Populations of this species in the eastern U.S. have declined dramatically and have been listed as Endangered by USFWS. Although more widely distributed in the western U. S., population declines have been reported range-wide (Pierson et al. 1999), including losses of 13 historically known maternity and hibernating colonies in Utah (Pierson et al. 1999). During 2001, a Memorandum of Understanding was developed among members of the Western Association of Fish and Wildlife Agencies recognizing the need for conservation actions directed at Townsend's big-eared bat.

Statement of habitat needs and threats to the species. The loss of roost habitat is the major threat to populations in Utah. Abandoned mine closure has been responsible for the loss of roost sites in Utah and has been identified as a major threat to populations range-wide (see Pierson et al. 1999). Although abandoned mine reclamation involving the Utah Division of Oil, Gas, and Mining (UDOGM) now routinely incorporates the evaluation and protection of mines as roosts, roosts in mines are not comprehensively protected throughout the state, and roosts in natural caverns are largely unprotected.

Disturbance to colonies at roost sites is also a major threat to population viability. Seasonal aggregations of hibernating individuals or females and offspring (i.e., maternity colonies) result in large proportions of populations being concentrated at few roost sites. These colonies characteristically utilize exposed roost sites; most other cavern-roosting species use protected recesses and concealed locations as roost sites. For this reason, Townsend's big-eared bat populations are especially vulnerable to vandalism and disturbance. Relatively low-intensity disturbance at maternity sites sometimes results in roost abandonment (Humphrey and Kunz 1976). If maternity colonies are excluded from suitable sites, juvenile survivorship can be affected, and in extreme cases reproductive failure for the entire colony can result. Bats that are disturbed during the hibernation period can sometimes change their winter activity patterns, thereby increasing metabolic expenditures and ultimately depleting energy stores. In cases where disturbance is severe or chronic, winter survivorship and reproductive success can be affected.

Pervasive depression of reproductive success or adult survivorship has important implications for long-term population viability. Adults are long-lived, many living to 10 years, and at least some exceeding 20 years of age. The reproductive rate is low, however, with most females producing a single offspring annually. For this reason, populations are slow to recover from periods of abnormally high mortality or low juvenile recruitment.

Anticipated costs and savings. Conservation of Townsend's big-eared bats will require a program to monitor and manage existing roost sites, including abandoned mines and natural caverns. A comprehensive conservation plan is needed, including cooperative action between state agencies, local governments, federal agencies, and private landowners. This plan should identify the quantity of roost habitat to be maintained, provide a list of actions to minimize disturbance of existing colonies, and provide for cooperation through incentive-based compliance by private landowners. This foresighted state management should prevent listing of Townsend's big-eared bats under ESA, which places additional federal restrictions on the management and use of abandoned mines and caverns, and could affect recreation and development activities, with resulting negative effects on local economies.

Rationale for proposed designation. Towsend's big-eared bat populations have declined significantly in the last fifty years. Thirteen known historical maternity colonies in Utah have

disappeared. This species appears to be declining range-wide. Townsend's big-eared bat is one of the bat species most sensitive to human disturbance. Roost preferences leave Townsend's big-eared bats vulnerable to disturbance. This species has a very low reproductive potential, and therefore once populations are reduced in number, they are slow to rebuild.

7.3 *Euderma maculatum,* spotted bat

Species status statement. The spotted bat is widely distributed throughout the western states, ranging south into Mexico and north into British Columbia. *Euderma maculatum* is believed to occur throughout Utah, but records from the extreme northern and western regions of the state are not known (Oliver 2000). There is evidence of hibernation and winter activity of *E. maculatum* in the southwestern corner of the state (Hardy 1941). Despite its wide distribution, the spotted bat is rarely captured in areas where it occurs, making abundance difficult to estimate. It has been characterized as a late, high-flier which makes mist-netting difficult (Wai-Ping and Fenton 1989, Easterla 1973). In five separate studies which successfully trapped *E. maculatum,* relative abundance ranged from 0.02-4.5% of total bats captured (Shuster 1957, Pritchett [no date]). Hasenyager (1980) ranked this species as 16th in abundance of the 18 species of bats occurring in Utah.

Birth takes place during June or July. Nursing females have been reported from June 23 to July 1 in New Mexico (Jones 1961) and in the second and third week of August in Utah (Easterla 1965). Because reproductive potential is low, with only one offspring produced annually (Easterla 1971), spotted bat populations that have been reduced by excessive mortality will have difficulty recovering.

From 1891, when *Euderma maculatum* was first described, to 1965, only 35 specimens were reported in the scientific literature (Watkins 1977). Due to its rarity in collections, *Euderma maculatum* was listed as "Rare" on the Bureau of Sport Fisheries and Wildlife Rare and Endangered Species List in 1968 (Snow undated) and in the IUCN's Red Data Book (IUCN 1969). *E. maculatum* was also listed on the USDA Forest Service's Sensitive Species List (USDA Forest Service 1998) and the Arizona State Office of the Bureau of Land Management's Sensitive Species List in 2000 (USDI, BLM 2000).

Statement of habitat needs and threats to the species. The spotted bat occupies a wide variety of habitats, but has been collected most often in dry, rough, desert terrain (Watkins 1977). Roosts are typically in rock crevices or under loose rocks or boulders. Because *E. maculatum* is a rare species with distinctive markings, collection pressure is high in some populations.

Anticipated costs and savings. The costs associated with conserving spotted bats will include greater survey efforts to document the species' distribution in Utah, periodic monitoring of population trends and causes of death, and effective control of collection activity. The savings from thoughtful state management management efforts should prevent listing of spotted bats under ESA, where additional federal restrictions on the management and use of the desert habitats it requires may reduce recreation and development activities, with resulting negative effects on local economies.

Rationale for proposed designation. The spotted bat is rare in Utah. Capture percentages in areas of occurrence ranged from 0.02% to 4.5%. This species was ranked as 16th in abundance of 18 total species. The spotted bat has a very low reproductive potential, and therefore once populations are reduced in number, they are slow to rebuild. The collection pressure for the spotted bat is high. For these reasons, the spotted bat is designated as a Species of Concern.

7.4 *Idionycteris phyllotis,* Allen's big-eared bat

Species status statement. Allen's big-eared bat inhabits mountainous regions of the southwestern United States and Mexico. The northernmost limit of its range occurs in Utah where it occurs in the southern third of the state including Grand, San Juan, Washington, Garfield, and Kane counties (Oliver 2000). This species is the second most-rarely encountered bat species in Utah (Oliver 2000). It was the last bat species to be discovered in Utah, being first captured in 1969 (Black 1970). Among five separate studies, relative abundance ranged from 0.3 to 2.5% of total captures in studies where the total capture number exceeded 100 individuals (Mollhagen and Bogan 1997, Jackson and Herder 1997, Day and Peterson 1999a, Day and Peterson 1999b).

Statement of habitat needs and threats to the species. Allen's big-eared bats occur primarily in forested mountain areas, from pine (*Pinus* spp.) and oak (*Quercus* spp.) to riparian

woodlands of cottonwood (*Populus* spp.) and willow (*Salix* spp.). In Utah, this species has been collected in arid environments of pinyon-juniper habitat or salt-cedar (*Tamarix chinensis*). Females segregate from males during the summer breeding season to form maternity colonies. These colonies typically are located in mine tunnels or in boulder piles (Cockrum and Musgrove 1964, Commissaris 1961). Females usually produce a single offspring annually. Low reproductive potential contributes to the reduced ability of *Idionycteris phyllotis* to cope with periods of high mortality.

Idionycteris phyllotis is particularly sensitive to human disturbance. Disturbance of maternity colonies often results in abandonment of the roost site and may result in reproductive failure for the breeding season. Several historically active maternity colonies in Utah have disappeared within the last four decades. Barbour and Davis (1969) documented the disappearance of a maternity colony subsequent to the initial visit by Commissaris (1961).

Mine closure and destruction of roost sites represent substantial threats to the survival of this species. Abandoned mine closure has greatly reduced available roost sites for this and many other bat species, range-wide. Additional roost sites remain largely unprotected. Cockrum et al. (1996) reported the destruction of a major roost site of *I. phyllotis* by the relocation of a highway and closure of the associated tunnel.

Anticipated costs and savings. Costs associated with conservation of Allen's big-eared bats will include continued monitoring of population distribution and status, and development of programs to monitor roost sites and their management. These outcome-oriented, state-driven programs should prevent federal listing of Allen's big-eared bats under ESA. Federal listing may result in additional restrictions on land uses, particularly recreation and development, with negative impacts on rural economies.

Rationale for proposed designation. Allen's big-eared bat is one of the rarest bats in Utah (0.3-2.5% capture percentage). Threats to the species include mine closure and reduction of roost sites. Allen's big-eared bat has a low reproductive potential, and therefore once populations are reduced in number, they are slow to rebuild. For these reasons, the Allen's big-eared bat is designated a Species of Concern.

7.5 *Lasiurus blossevillii,* western red bat

Species status statement. The western red bat has a broad distribution reaching from southern British Columbia, through much of the western United States, and extending into South America. In Utah, this species appears to be sparsely distributed along a corridor extending through north-central, central, and southwestern Utah.

The Western red bat is very rare in Utah, and ranks last in abundance of the 18 bat species known to occur in the state (Oliver 2000). Only 14 specimens have been recorded for Utah. This species is believed to have declined markedly in the West.

Statement of habitat needs and threats to the species. *L. blossevillii* is largely dependant on broad-leaf shrubs and trees in lowland (below 5,700 ft. elevation) riparian zones for roosting and foraging, typically roosting in the foliage of cottonwood trees. Young western red bats are born in May to mid-June. Female *L. blossevillii* may bear 1 to 4 (2.3 average) young, a high reproductive potential among bat species.

The degradation and destruction of lowland riparian habitat is a threat to the western red bat. Lowland riparian areas occupy only 0.23% (317 mi^2) of the total area of the state and are subject to a host of disturbances including dewatering, livestock trampling, pollution from pesticides, and agricultural runoff (Parrish et al. 1999). The Virgin River drainage system in Washington County, from which most records of the western red bat have been reported, has incurred substantial losses of suitable habitat.

Anticipated costs and savings. The costs of conserving western red bats will include a program that uses additional surveys to document the species' distribution and status throughout Utah's riparian areas, and subsequent conservation measures that protect occupied habitats. This will involve periodic monitoring of population trends. Given the rarity of this species and its dependence upon riparian zones, conservation measures will likely focus on maintaining adequate riparian habitat in Utah. State habitat conservation may involve conservation easements, land purchases, cooperative programs to manage water, grazing, and mining, and/or landowner incentives to maintain occupied habitat. These types of state-driven programs should prevent federal listing of western red bats under ESA. Federal listing of western red bats may result in additional restrictions on land and water use, with negative impacts on rural economies in north-central, central and southwestern Utah.

Rationale for proposed designation. The Western red bat is dependent on lowland riparian zones for roosting and foraging. Lowland riparian habitat is one of the most threatened and compromised habitats in Utah. Western red bat populations have been estimated to have declined markedly throughout the West. For these reasons, the Western red bat is designated as a Species of Concern.

7.6 *Myotis thysanodes,* fringed myotis

Species status statement. *Myotis thysanodes* is found in a range of habitats from low desert scrub to fir-pine associations. Oak (*Quercus* spp.) and pinyon (*Pinus* spp.) woodlands are the most commonly used vegetative types (O'Farrell and Studier 1980, Findley et al. 1975). The fringed myotis is distributed over much of the western United States, extending from northern Washington south to southern California and southern Texas (O'Farrell and Studier 1980). In Utah, this species is known to occur in six counties including Washington, Garfield, Kane, San Juan, Uintah, and Grand (Oliver 2000).

Though this species is widely distributed, it is apparently rare in Utah. In five separate studies which successfully captured fringed myotis, the capture rate ranged from 0.6% of samples in a Tooele County-based study to 40% in a study based in southwestern Utah. Hasenyager (1980) ranked this species' abundance in Utah as 14th out of the 18 species occurring in the state.

Statement of habitat needs and threats to the species. *Myotis thysanodes* commonly roosts in mine tunnels, caves, and buildings. Any of these structures may serve for day or night roosts (Pearson et al. 1952). *M. thysanodes* typically roosts in the open in tightly packed clusters, making it vulnerable to a host of anthropogenic factors including vandalism and disturbance during the hibernation period.

M. thysanodes usually produces a single offspring annually. Low reproductive potential contributes to the reduced ability of *M. thysanodes* to survive catastrophic events and periods of high mortality.

This species in known to be migratory, though the extent of migration and destination sites are largely unknown. Studier and O'Farrell (1972) speculated that fall migrations were of

short distances corresponding to changes in elevation or to more southern areas where periodic winter activity would be possible.

Human disturbance of roosts in caves, mines, and buildings may be the most serious threat to this species. *M. thysanodes* is particularly susceptible to disturbance especially prior to birth when maternity colonies are formed (Oliver 2000). At this time females become increasingly secretive and are virtually impossible to approach (O'Farrell and Studier 1980). Extensive or prolonged disturbance may contribute to lower juvenile recruitment or reproductive failure of the colony. Wanton destruction of roosting *M. thysanodes* has occurred at many sites in Utah.

Water courses and lowland riparian areas are very important for this bat species. Lowland riparian areas occupy only 0.23% (317 mi^2) of the total area of the state (Parrish et al. 1999), and are threatened by a variety of factors including pollution, overgrazing, and agricultural runoff. Destruction and degradation of these important areas adversely affects many of Utah's bat species (Oliver 2000).

Anticipated costs and savings. Costs associated with State conservation of fringed myotis will include programs to continue monitoring population distribution and status, and development of programs to monitor and manage roost sites and riparian habitats. State habitat conservation may involve conservation easements, land purchase, cooperative programs to manage water, grazing, and mining, and/or landowner incentives to maintain occupied habitat including roost sites. These proactive state-driven programs should prevent federal listing of fringed myotis under ESA. Therefore, they should reduce the likelihood of additional restrictions on land use, particularly recreation and development, which often accompany federal listing, producing cascading effects on local economies in rural Utah.

Rationale for proposed designation. The fringed myotis is rare in Utah. This species was ranked 14th in abundance of the 18 bat species in Utah. Fringed myotis are highly susceptible to human disturbance and wanton destruction of roosting sites has occurred at many Utah localities. Riparian areas, which are among the most threatened and compromised areas in Utah, are very important for this species. For these reasons, the fringed myotis is designated as a Species of Concern.

7.7 *Nyctinomops macrotis,* big free-tailed bat

Species status statement. Big free-tailed bats range from southern and western Texas to southern California and southeastern Nevada, and north to central Colorado and southern Utah (Milner et al. 1990). In Utah, specimens have been collected from six counties including Millard, San Juan, Utah, Washington, Wayne and Grand counties (Oliver 2000). This species' distribution has been mapped as highly fragmented (Barbour and Davis 1969). Big free-tailed bats have not been mist-netted in large sections of supposed suitable habitat. This species' unique roost requirements may contribute to its apparent fragmented distribution.

The big free-tailed bat is relatively rare in Utah. Among six separate studies that captured *N. macrotis,* capture percentages ranged from 0.5-3.4% of total captures where total number of bats captured exceeded 150. Prichett (no date) postulated that based on rough sampling techniques, this species has experienced significant declines in the past two decades. *N. macrotis* was listed on the Bureau of Land Management's Sensitive Species list in 2000 (USDI, BLM 2000).

Statement of habitat needs and threats to the species. In the southwestern United States, the big free-tailed bat inhabits rugged, rocky terrain. This species is a seasonal migrant throughout most of its range. Big free-tailed bats typically roost in rock crevices, but will also occasionally roost in caves, buildings, and tree holes.

The unique wing morphology of this species requires the presence of an extensive vertical drop to achieve flight which likely contributes to the selection of a roost site (Milner et al. 1990). Roost site availability is greatly reduced for *N. macrotis* due to this unique limitation.

Big free-tailed bats form maternity colonies and the sexes remain segregated throughout the summer months while the young are being raised (Schmidly 1977). Females bear one offspring usually in late spring or early summer. Because they have limited reproductive potential, big free-tailed bat populations have difficulty recovering from periods of high mortality.

Anticipated costs and savings. Costs associated with conservation of big free-tailed bats will include programs to continue monitoring the population's distribution and status, and development of programs to locate and monitor roost sites and their management. These state-level programs get ahead of the "petitioning" curve, and should prevent federal listing of

big free-tailed bats under ESA. Therefore, they should reduce the likelihood of additional restrictions on land use which accompany federal listing and could produce cascading effects on local economies in rural Utah. A state-driven approach preserves local decision flexibility.

Rationale for proposed designation. The big free-tailed bat is rare in Utah (0.5-3.4% capture percentage). The distribution of this species is highly fragmented. Preliminary investigation suggests substantial population declines in the past two decades. For these reasons, the big free-tailed bat is designated as a Species of Concern.

7.8 *Brachylagus idahoensis*, pygmy rabbit

Species status statement. Although reported throughout the Great Basin, pygmy rabbits occur in isolated patches due to their specific life history requirements. Eight western states (Washington, Oregon, California, Idaho, Nevada, Montana, Utah, and Wyoming) encompass the pygmy rabbit's current distribution. In Utah, the pygmy rabbit's range is limited to the western half of the state with additional occurrences in Cache, Rich, and Wayne Counties. This distribution is determined by the presence of deep soils and tall, dense sagebrush. Janson (2002) theorized that pygmy rabbit distribution was affected by Pleistocene Lake Bonneville (see also Durrant 1952). Currently, no known pygmy rabbit locations are below the historic elevation of the lake's water level.

Outside of Utah, very little population trend data has been collected for the pygmy rabbit. Janson (2002) resurveyed sites that were occupied by pygmy rabbit populations during the 1940s (Janson 1940, Janson 1946). Throughout their Utah range, he noted significant changes to the habitat and a corresponding loss of pygmy rabbits. In comparison to Montana and Idaho, Janson ranked Utah's pygmy rabbit populations "most at risk" (Janson 2002).

Statement of habitat needs and threats to the species. The pygmy rabbit is North America's smallest rabbit species and is unique among western leporids by virtue of its burrowing habits, limited home range size, and its near total dependency on mature sagebrush (*Artemisia* spp.). Characterized as a sagebrush obligate, the pygmy rabbit requires areas of tall shrubs (53-75cm) with high shrub cover (21%-36.2%) (Green and Flinders 1980, Weiss and Verts 1984, Washington Department of Fish and Wildlife 1995, Katzner and Parker 1997). The importance of sagebrush is also reflected in the pygmy rabbit's diet. Sagebrush species dominate

winter diets (81%-99%) while summer diets, although still heavily favoring sagebrush, shift to favor more grasses (39%) and forbs (10%) (Green and Flinders 1980, Gahr 1993). Owing to the pygmy rabbit's unique habit of digging its own burrows, deep and loose soils have also been shown to be an important factor defining pygmy rabbit habitat (Wilde 1978, Weiss and Verts 1984, Janson 2002). Burrows are generally characterized by 1 to 7 openings with entrances positioned directly beneath individual shrubs (Wilde 1978, Rauscher 1997, Janson 2002). Home ranges reported for pygmy rabbits rarely describe rabbits utilizing vegetation beyond 30 meters of their burrow, although the capacity to move much longer distances (2-3.5km) has been reported (Green and Flinders 1979, Katzner 1994, Katzner and Parker 1997, Katzner and Parker 1998).

The principal cause of the pygmy rabbit's decline is the fragmentation and degradation of mature sagebrush habitat due to a variety of anthropogenic factors, including increased fire frequency, conversion to agriculture, suburban encroachment, overgrazing, and large-scale chemical treatment projects designed to essentially remove sagebrush and increase grass production for livestock grazing purposes (current knowledge suggests that removing sagebrush from whole areas is ill-advised). These factors have resulted in the creation of isolated populations of rabbits that are inherently more vulnerable to genetic and demographic stochasticity and limitation by predators. For this and other reasons, the pygmy rabbit is at great risk even compared to other sagebrush-obligate species.

Similar trends are noted in surrounding states with revocation of game status and invocation of species-of-concern status in Montana, Idaho, Wyoming, Nevada, and California. Pygmy rabbits were listed as state threatened in Washington during 1990 and then upgraded to state endangered in 1993. A petition for federal listing was submitted to the U.S. Fish and Wildlife Service on April 1, 2003.

Anticipated costs and savings. Costs associated with conservation of pygmy rabbits will include intensified surveys to document their present distribution in Utah, research to improve understanding of their habitat relationships, periodic monitoring of population and habitat trends, and farsighted, long-term habitat management efforts. Pygmy rabbits will be one "focus" species in DWR's sagebrush-steppe habitat restoration programs on state and federal lands. Habitat management guidelines and incentives to retain pygmy rabbit habitat will be

incorporated into cooperative state-private landowner programs. Coordinated multi-state efforts are required to meet the range-wide conservation needs of pygmy rabbits. If these monitoring and conservation programs are successful, Utah may save substantial costs associated with federal designation under ESA. These costs associated with federal listing are likely to stem from land-use restrictions directed at grazing, mining, development, and agricultural activities on rangelands designated as pygmy rabbit habitat. Such restrictions would have detrimental effects on rural economies.

Rationale for proposed designation. The pygmy rabbit is a sagebrush obligate requiring deep soils for burrow excavation. This habitat is threatened by increased fire frequency, conversion to agriculture, suburban encroachment, overgrazing, and sagebrush "control" projects historically associated with livestock grazing. Increased isolation of individual populations makes them inherently more vulnerable to loss of genetic variability, haphazard demographic shifts, and population limitation by predators. Preliminary studies show that the pygmy rabbit remains in only a small proportion of its historical range in Utah. In April 2003, U.S. Fish and Wildlife Service was petitioned to list the pygmy rabbit under the Endangered Species Act throughout its geographic range. For these reasons, the pygmy rabbit is designated as a Species of Concern.

7.9 *Cynomys gunnisoni*, Gunnison's prairie-dog

Species status statement. Gunnison's prairie-dog (GPD) occurs in northern Arizona (30% of range), southwestern Colorado (22% of range), northwestern New Mexico (45% of its range), and extreme southeastern Utah (3% of its range). The range of the GPD is approximately 65% larger than the white-tailed prairie-dog (Knowles 2002). In Utah, the GPD is found in San Juan County and Grand County south of Moab. In 2002, 3,779 acres of prairie-dog colonies were mapped on public lands (UDWR File Data).

GPD populations today are highly fragmented into complexes of small, isolated colonies due to poisoning and plague (Knowles 2002). The large mega complexes that existed historically are gone, making remnant colonies more susceptible to catastrophic events, such as die-offs from outbreaks of sylvatic plague. The total population of GPD numbers between 1-2 million individuals (Knowles 2002).

Statement of habitat needs and threats to the species. Gunnison's prairie-dogs inhabit grasslands, semidesert and montane shrublands (Fitzgerald et al. 1994). Their diet consists mostly of grasses and sedges. GPD cease above-ground activity and hibernate in October, emerging from hibernation in mid-April. Hibernation at lower elevations is reduced and individuals may be active above-ground during winter months (Rayor et al. 1987).

Reproduction occurs shortly after emergence from hibernation. Gestation is estimated to be 30 days with young remaining underground for 4-6 weeks after birth. Females produce a single litter of 4-5 young each year (Cully 1997, Hoogland 2001). However, fewer young survive to emergence. Survivorship through the first year is less than 60% and remains low throughout the life span of the animal (Hoogland 2001).

Densities of GPD vary from 5-6 to over 57 animals per/ha (Fitzgerald and Lechleitner 1974, Rayor 1985, Fitzgerald et al. 1994). Burrow systems and mound constructions are not well developed in GPD.

An important threat to GPD populations has been the introduction of sylvatic plague (*Yersinia pestis*) into their range beginning in the late 1930s (Lechleitner et al. 1968, Cully 1993). Prairie-dogs appear to have little immunity to this disease and thus plague can have devastating effects. Other threats include urbanization, conversion of habitat to agriculture, and Federal and State run eradication campaigns that incorporate poisoning. Recreational shooting may limit local colonies in combination with sylvatic plague, but it has not been confirmed as a threat to populations (Knowles 2002).

Anticipated costs and savings. Conservation programs for Gunnison's prairie-dogs will require continued efforts to document their distribution on both public and private lands, monitoring of populations and harvests, and the monitoring and management of disease (sylvatic plague). The Division has the lead role in developing a multi-state conservation assessment for Gunnison's prairie-dogs. Their conservation needs, including population, harvest, and habitat management will be addressed through coordinated efforts following the multi-state conservation assessment. If these state-driven conservation programs are successful, Utah will save substantial costs which would have come about in association with federal designation under ESA. These costs are likely to include land-use restrictions directed at grazing, mining, development, and agriculture activities on rangelands that are designated as Gunnison's

prairie-dog habitat, and greater restrictions on both recreational shooting and the allowable measures of controlling agricultural and residential damage.

Rationale for proposed designation. The Gunnison's prairie-dog is very susceptible to sylvatic plague and this disease constitutes the predominant factor limiting populations, as mortality from plague frequently exceeds 99%. Population recovery from plague is variable. Plague cycles can result in successive population peaks that are progressively lower than the previous peak and loss of colonies to plague can exceed the rate of establishment of new colonies.

Poisoning of colonies was significant in the early settlement process. Poisoning continues on private lands. Displacement and contraction of colonies due to urbanization, agricultural land conversion, and for resource development threatens this species. For these reasons, the Gunnison's prairie-dog is designated a Species of Concern.

7.10 *Cynomys leucurus*, white-tailed prairie-dog

Species status statement. White-tailed prairie-dog (WTPD) occur in Montana (1% of the range), Wyoming (71% of the range), Utah (12% of the range), and Colorado (16% of the range) (Knowles 2002). In Utah, WTPD occur in the eastern portion of the state, primarily in the Uintah Basin and the northern portion of the Colorado Plateau. Rangewide, the WTPD population is estimated at 1-2 million individuals (Knowles 2001).

Northern Region - Little mapping of prairie-dog acreage has been completed in this region, and only a few colonies are known to exist. Areas that have been mapped are located on Deseret Land and Livestock properties along the Wyoming border, where 784 acres of active colonies were mapped in response to pipeline development.

Northeastern region - WTPD occur in areas around Flaming Gorge/Manila, Diamond Mountain, and in the Uintah Basin. Active prairie-dog towns are located as far west as Fruitland, north to the Wyoming state line, east to the Colorado state line, and south onto the Book Cliffs and Anthro Mountain. To date, 87,524 acres of an estimated 90,000 to 100,000 acres of active prairie-dog colonies have been identified in the Northeast Region. Areas that remain to be surveyed should only contain scattered, small colonies surrounded by rocky terrain that is unsuitable as prairie-dog habitat.

Southeastern Region - WTPD colonies are located in Grand, Emery, and Carbon Counties. In 1985, colonies of WTPD were mapped and population densities estimated in an attempt to identify potential reintroduction sites for black-footed ferrets (*Mustela nigripes*). Though these surveys were not exhaustive, 63,397 acres of WTPD colonies were mapped. Surveys completed in 2002 on public lands within southeastern Utah identified only 10,257 acres of active colonies, or an 84% decline in occupied acreage of WTPD colonies since 1985.

Outside of potential black-footed ferret reintroduction sites (Coyote Basin in Uintah County, Cisco Desert in Emery and Grand Counties), information concerning occupied acreage and population trends of WTPD is somewhat less detailed. WTPD have been greatly reduced in overall abundance, though their historic range is still intermittently occupied albeit with much-reduced numbers of WTPD. Unfortunately, original baseline population figures are not available, so there is no reliable mechanism for estimating the percentage decline in population status.

Statement of habitat needs and threats to the species. White-tailed prairie-dogs inhabit mountain valleys, semidesert grasslands, agricultural areas, and open shrublands in Western North America (Fitzgerald et al. 1994, Hall 1981). They are distributed in relatively large, sparsely populated complexes and live in loosely knit family groups or "clans" (Tileston and Lechleitner 1966). Clan boundaries are ill-defined with most activity being concentrated around feeding sites.

Breeding occurs in late March to early April after adults emerge from burrows. Females produce a single litter each year. Gestation lasts 30 days (Bakko and Brown 1967) with an average of 5.6 young born in late April to May. WTPD, however, are dynamic breeders and appear to be able to adjust their reproductive output in response to resource abundance (Menkens and Anderson 1989). Reproductive success has been found to be dependent on body weight with heavier males siring more offspring, juveniles reaching sexual maturity earlier, and litter size correlating directly with female body mass (Rayor 1985, Hoogland 2001).

The main threat to WTPD populations has been the introduction of sylvatic plague *(Yersinia pestis)* into North America in the late 1930's (Lechleitner et al. 1968, Cully 1993). Prairie-dogs appear to have little immunity to this disease; plague epizootics frequently kill > 99% of prairie-dogs in infected colonies (Cully and Williams 2001, Clark et al. 1989). Other

threats include oil, gas, and mineral extraction, urbanization, conversion of land to agriculture, and Federal and State sponsered eradication campaigns. Recreational shooting pressure is capable of reducing prairie-dog numbers on a local scale, in conjunction with outbreaks of sylvatic plague. However, it has not been documented to threaten population stability alone (Knowles 2002).

Anticipated costs and savings. Conservation programs for white-tailed prairie-dogs will require continued efforts to document their distribution on both public and private lands, monitoring of populations and harvests, and the monitoring and management of disease (Sylvatic plague). The Division has the lead role in developing a multi-state conservation assessment for white-tailed prairie-dogs. Their conservation needs, including population, harvest and habitat management, will be addressed through coordinated efforts following the multi-state conservation assessment. If these state-driven conservation programs are successful, Utah will save substantial costs associated with federal designation under ESA. These costs are likely to include land-use restrictions directed at grazing, mining, development and agricultural activities on rangelands that are designated as white-tailed prairie-dog habitat, and greater restrictions on both recreational shooting and measures of controlling agricultural and residential damage. The U.S. Fish and Wildlife Service was petitioned in 2002 to list white-tailed prairie-dogs under ESA, and will rely heavily upon the multi-state conservation assessment to determine whether listing is warranted.

Rationale for proposed designation. The white-tailed prairie-dog is very susceptible to sylvatic plague, and plague has decimated Southern Utah populations by up to 84%. Rarely do populations rebound to previous numbers and occupied acreage. Poisoning of white-tailed prairie-dogs occurs on private lands. Additional threats to this species include grazing, fire suppression, agriculture conversion, urbanization and oil/gas development. The U.S. Fish and Wildlife Service was petitioned in 2002 to list the white-tailed prairie-dog under ESA. For these reasons, the white-tailed prairie-dog is designated as a Species of Concern.

7.11 *Perognathus flavus,* silky pocket mouse

Species status statement. The silky pocket mouse is distributed throughout the south-central portion of the United States and Mexico. In Utah, this species is limited to the extreme southern corner of San Juan County (Oliver 1997).

The silky pocket mouse is rare in Utah and surrounding areas. It is listed as critically imperiled in Colorado (The Nature Conservancy 2003). In Utah, 16 specimens have been reported, representing only five localities (Durrant 1952).

Statement of habitat needs and threats to the species. This species inhabits semidesert arid grasslands with rocky or loamy soils. The most significant factors in the presence and distribution of the silky pocket mouse appear to be rock and soil particle size (Fitzgerald et al. 1994). The presence of short grass cover is also very important for this species. "Tall, dense ground cover restricts its movements, whereas short ground cover (six inches or less in height) does not" (New Mexico Game and Fish [no date]).

While other threats may become apparent in Utah, animal damage control efforts have caused adverse documented effects in New Mexico (New Mexico Game and Fish [no date]).

Anticipated costs and savings. Costs associated with conserving the silky pocket mouse will include programs to continue monitoring their distribution and population trends, and the development of programs to maintain their habitat. Given the species' dependence on short grasslands occurring with rocky or loam soils, efforts to perpetuate this habitat will minimize the potential for listing under ESA. Better management of threats to silky pocket mice within Utah will require more research to improve understanding of their habitat relationships. Animal damage control programs should also be revised to remove materials and procedures that are threats within the silky pocket mouse's range. These actions could provide meaningful steps to prevent the need for listing of the silky pocket mouse under ESA.

Rationale for proposed designation. The silky pocket mouse is rare in Utah; only five localities have yielded specimens. This species is listed as critically imperiled in Colorado. Substantial losses from animal damage control efforts employing poisons have been documented in several areas. For these reasons, the silky pocket mouse is designated as a Species of Concern.

7.12 *Microdipodops megacephalus,* dark kangaroo mouse

Species status statement. The dark kangaroo mouse is restricted to the Great Basin, occurring in Nevada, Oregon, Idaho, and Utah. Within this region the distribution of this species is largely discontinuous, being determined by the presence of appropriate habitat. The

fragmented distribution of *M. megacephalus* in Utah comprises isolated populations (Zeveloff 1988, Rickart pers. comm. 1997) which are vulnerable to demographic, environmental, and genetic stochasticity (Sznajd-Weron 2000). This species is present in Tooele, Juab, Millard, and Beaver counties.

There are two subspecies of dark kangaroo mouse (*Microdipodops megacephalus leucotis* and *M. megacacephalus paululus*) present in Utah, and both are endemic to the state (Hall 1981).

The dark kangaroo mouse has been identified in only eight localities in Utah. Rickart (pers. comm. 1997) estimated *M. megacephalus* in Utah have experienced substantial declines in abundance since 1960.

Statement of habitat needs and threats to the species. The dark kangaroo mouse occupies regions of the Upper Sonoran sagebrush desert and is associated with sage, shadscale, and fine, gravelly soil (Zeveloff 1988). It also occurs in areas of sand dunes near margins of its range.

Dark kangaroo mice reproduce from the end of April through September, with most of the young being born in May and June. Litter size ranges from 2 to 7 (4.0 average). Drought, which effects the production of annual plants may contribute to reproductive declines (Zeveloff 1988).

The principle threat to this species comprises the drastic modification and degradation of suitable habitat resulting from invading non-native grasses and increased incidence of wildfire. Cheatgrass (*Bromus tectorum*), a vigorous exotic annual introduced to the Intermountain West in the late 1800s, was reported as the dominant plant species on more than 40.5 million ha (100 million acres) in the Intermountain West by 1981 (Bureau of Land Management 2003). Due to its flammability, cheatgrass greatly increases the wildfire potential on a site. The presence of cheatgrass as the dominant vegetative type can increase the fire recurrence interval from the natural 20 to 100 years for sagebrush- grassland ecosystems to 3 to 5 years for cheatgrass-dominant sites (Bureau of Land Management 2003). This contributes to the reduction of native shrubs and forbs greatly reducing the available cover and food sources for *M. megacephalus*. Areas dominated by cheatgrass and other exotic grasses are no longer able to support *M. megacephalus* populations.

Anticipated costs and savings. The costs associated with conserving the dark kangaroo mouse will include continued monitoring of their distribution and population trends and the development of programs to provide guidance to land managers for maintaining their habitat. Because the species is threatened by invasion of exotic grasses (especially cheatgrass) and increased incidence of wildfire, habitat management programs will include measures to prevent invasion of exotics, recover native grasslands, and manage wildfires.

Rationale for proposed designation. Two subspecies of dark kangaroo mouse occur in Utah and both are endemic to the state. A large portion of the overall distribution of this species occurs in Utah and rangewide distribution is believed to be discontinuous. Dark kangaroo mouse populations in Utah have declined since 1960. This species is threatened by drastic habitat change resulting from invading non-native annual grasses. For these reasons, the dark kangaroo mouse is designated as a Species of Concern.

7.13 *Microtus mexicanus,* Mexican vole

Species status statement. In Utah, the Mexican vole is restricted to Navajo Mountain in extreme southwestern San Juan county where it is known to occur in five distinct localities.

Mexican vole abundance has reportedly declined since the 1930s (Spicer 1987). This apparent decline has been attributed largely to the degradation of Mexican vole habitat resulting from extensive overgrazing by livestock. During 1985 and 1986, Spicer (1987) observed that only one of the traditional seep and spring areas, historically used by Mexican voles on Navajo Mountain, supported even a few grasses and forbs. The others were bare of native plants and were being used heavily by sheep and other livestock.

Based on mtDNA analysis and morphological features, Frey and Yates (1995) have suggested that *Microtus mexicanus* as previously recognized actually represents two distinct species. Under this new classification, the species occurring in the United States should be designated *Microtus mogollonensis.* Pending recognition of their research by the scientific community, the former species designation has been listed here.

The subspecies of Mexican vole occurring in Utah, *Microtus mexicanus navaho,* is nearly endemic to the state, barely occurring in northern Arizona.

Statement of habitat needs and threats to the species. Mexican voles inhabit thickets of *Ceanothus*, *Symphoricarpos*, *Arctostaphylos*, and *Rosa* (Benson 1935) shrubs, as they require thick stands of brush for concealment. They rely almost entirely on vegetation for their food source, utilizing the green parts of grasses and forbs in the summer months and the basal portions of roots and bulbs in the winter months. Mexican voles do not store food and therefore rely on a year-round supply of fresh vegetation.

Habitat degradation represents the greatest threat to this species. Continued heavy browsing has removed essential forbs and shrub patches from suitable Mexican vole habitat (Spicer 1987).

Anticipated costs and savings. Costs associated with conserving the Mexican vole will include establishing a program to periodically monitor their abundance and status within the Navajo Mountains, and developing programs to conserve and improve habitat conditions through management of grazing, primarily through coordination with federal land management agencies.

Rationale for proposed designation. The race of Mexican vole occurring in Utah is nearly endemic to the state, barely occurring outside of Utah. The distribution of this species in Utah limited to the Navajo Mountain region. Mexican vole abundance has declined since the 1930s. The greatest threat to this species is the destruction of native habitat. Livestock grazing, primarily of sheep, has removed essential forbs and shrubs from suitable Mexican vole habitat. For these reasons, the Mexican vole is designated as a Species of Concern.

7.14 *Vulpes macrotis*, kit fox

Species status statement. Historically, the kit fox occurred across much of northern Mexico, the Mojave Desert, the Central Valley of California, and the southern and central portions of the Great Basin. In Utah, the distribution of the kit fox is limited to the most arid portions of the state. The western half of the state, corresponding to the deep soils of the Pleistocene Lake Bonneville, and the western foothills of the Rocky Mountains south from the Cisco Desert to the Four Corners, delineate the two discontinuous populations of kit fox in Utah (Egoscue 1962, Thacker et al. 1995). Within these areas, kit fox populations occupy habitats that provide favorable combinations of low predator numbers, sufficient prey, and soils suitable for denning.

General inferences about kit fox population size or trends may be made using trapping success (standardized for effort) as an indicator of population fluctuations. A survey conducted by Novak and Satterthwaite during the 1983-84 hunting and trapping season reported a fox density of 101-200 km^2/animal harvested for Utah's western population and 11-100 km^2/animal harvested for Utah's eastern population (O'Farrell 1987). A further review of Utah's fur-harvest questionnaires completed in 1995 indicated a dramatic decrease in the size of the kit fox harvest between 1989 and 1993 (Thacker and Evans 1995). Similar declines were reported during a 1993-1995 study conducted by the Utah Division of Wildlife Resources near Antelope Valley in west central Utah (Thacker et al. 1995). Range-wide declines of western foxes have resulted in the federal listing of the San Joaquin kit fox as endangered in 1966, the listing of the closely related swift fox as threatened in 1994, and the protection of kit fox from take in Idaho and Oregon.

Statement of habitat needs and threats to the species. The kit fox is the smallest canid in North America (Hall 1946, Egoscue 1962). A desert-adapted fox, it is found exclusively in arid and semi-arid landscapes and is capable of meeting all its water requirements metabolically without the need for drinking water (Egoscue 1956, Morrell 1972, Golightly and Omart 1984). The kit fox is one of the few canids in the world to use year-round dens. Dens provide protection from predators, aid in thermoregulation, and reduce water loss. Although most dens in a territory will remain largely unused, up to 39 dens may be distributed across a fox's territory (Morrell 1972). Dispersal distances of young kit foxes average 11 km (O'Farrell 1984).

Threats to the kit fox in Utah are numerous. Invasive weeds affect the stability of the prey base by decreasing small mammal diversity and abundance. To compensate for a diminished prey base, kit fox home ranges become larger, fecundity declines, and dispersing young are required to travel farther in search of suitable home ranges making them more vulnerable to predators (Egoscue 1975, Zoellick 1985, Cypher and Scrivner 1992). Expanding water developments for game and livestock effectively decrease the amount of arid lands suitable only for kit fox occupation. Increased year-round availability of water in the harshest areas of Utah's deserts serve to augment and extend the distribution of coyotes into areas previously too arid to support them (Kozlowski, unpublished). Competitive interactions with larger canids, especially when populations are already depressed, can have major effects on kit fox populations (Cypher and Scrivner 1992, and White and Garrott 1999).

Anticipated costs and savings. Costs associated with conserving kit fox populations will involve programs to monitor population trends through field surveys and harvests, and efforts to manage threats resulting from habitat degradation. Kit fox conservation needs should be factored into plans for water developments to benefit other wildlife, livestock, and humans in arid environments. Programs to manage arid habitats will include control of invasive vegetation and promoting a shift toward suitable native vegetation.

Rationale for proposed designation. The kit fox is adapted to inhabit harsh, arid ecosystems as a means of predator avoidance. Water development may play a role in kit fox population dynamics, by extending the ranges of other, larger canids (e.g., coyote, red fox) which are known to prey upon kit fox. Kit fox populations appear to be declining range-wide. Harvest data has declined steeply over the last decade as has the number of anecdotal reports of sightings in areas of historical surveys. The kit fox, accordingly, is designated as a Species of Concern.

8. Phylum: Mollusca: Mollusks

8.1 *Ogaridiscus subrupicola,* southern tightcoil

Species status statement. The only Utah population is restricted to a small cave, an ecological setting that is unique among Utah's mollusks. The population is especially important because it is the type locality for the species; i.e., it is the location from which the specimens used to describe the species were collected. Furthermore, the southern tightcoil is known to occur at very few localities outside the state, making the Utah population significant to the conservation of this species range-wide.

This cave is currently located on privately owned land, which makes access difficult, and the population has not been assessed in many decades. This species was apparently rare and sparsely distributed within the cave during the early 1900s (Chamberlin and Jones 1929), but during this time cave disturbance was evidently high from frequent recreational use (see Chamberlin and Jones 1929). However, because access has been limited during recent decades, recreational disturbance to the cave habitat has been reduced, and the population is assumed to remain extant.

Statement of habitat needs and threats for the species. This species is found only within a small cave. Because the population is dependant on the habitat within this cave, any change to the cave environment has the potential of jeopardizing population viability, regardless of the current density of the population. Because the cave is located in proximity to large-scale mining operations, it is vulnerable to destruction or alteration from such mining activities.

Anticipated costs and savings. Protection of the southern tightcoil is of economic value to the state of Utah. A lack of proactive water, mining, and recreation management may lead to more population reductions of this species. If southern tightcoil numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The singular distribution of the southern tightcoil snail renders this species especially susceptible to any habitat loss or degradation from land development or mining, and so is designated as a Species of Concern.

8.2 *Oreohelix eurekensis,* Eureka mountainsnail

Species status statement. The Eureka mountainsnail is endemic to Utah, and its documented distribution comprises only four populations: one on the Juab-Utah county line (Henderson and Daniels 1916, 1917, Clarke 1993, Clarke and Hovingh 1994), one in eastern Duchesne County (Brooks 1939, Oliver and Bosworth 2000), one in the western portion of either Tooele or Juab counties (Roscoe 1954), and one in northern Grand County (Roscoe and Grosscup 1964).

Of the four localities that have been published, only two have been visited since their original discovery. An investigation during the past decade of the Juab-Utah county population (Clarke 1993) yielded only three live individuals; from his observations, Clarke (1993) produced a crude estimate of 50,000 to 500,000 individuals in the population. The colony in eastern Duchesne County was also recently relocated and was found to be extremely small, occupying an area of only 0.03 ha (0.075 acres; Oliver and Bosworth 2000). The locations of the remaining two colonies are not precisely known, and neither has been relocated since being discovered more than 40 years ago.

Statement of habitat needs and threats for the species. This terrestrial snail is found in both shrubland and forested habitats, associated with limestone outcrops or soils with high calcium concentration (Henderson and Daniels 1916, Roscoe 1954, Clarke 1993, Oliver and Bosworth 2000). Low-growing vegetation or a well-developed layer of plant litter is necessary to provide protection from desiccation and environmental extremes. Because of these specific habitat requirements, populations of the Eureka mountainsnail exist as colonies that occupy small patches of suitable habitat, and so populations are vulnerable to habitat disturbance of even limited extent or scope.

The principal threat to this species on the Juab-Utah county line is mining activities (Clarke 1993). Mining can result in destruction or alteration of habitat structure by affecting plant composition and has the potential to affect soil chemistry. This and other colonies are also vulnerable to the effects of range or forest fires (Clarke 1993, Oliver and Bosworth 2000), which could kill all snails within a colony or make the habitat unsuitable for any surviving individuals. Similarly, grazing is a threat, particularly to the colony in Duchesne County, where trampling of snails and loss of understory plants are of importance (Oliver and Bosworth 2000).

Anticipated costs and savings. Protection of the Eureka mountainsnail is of economic value to the state of Utah. A lack of proactive water, mining, and recreation management may lead to additional population reductions of this species. If Eureka mountainsnail numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the Eureka mountainsnail renders this species susceptible to habitat loss and degradation in an area experiencing increasing development, and so is designated as a Species of Concern.

8.3 *Oreohelix haydeni,* lyrate mountainsnail

Species status statement. Approximately 21 colonies of this species have been reported in Utah. Determination of whether some clustered localities are separate colonies, as Henderson and Daniels (1917) thought, or are large continuous colonies will require new field work. The distribution of this species in Utah is somewhat patchy and scattered through Cache, Rich, Weber, Morgan, Salt Lake, and Tooele counties.

Several colonies were reported to be declining during the early 1900s (Henderson and Daniels 1917), and no recent efforts have been made to verify their continued existence. Clarke (1993) evaluated colonies in Weber Canyon (i.e., the type locality for the type subspecies, *O. h. haydeni*) and near Richmond, Cache County (i.e., the type locality for the subspecies *O. h. corrugata*). At the former locality, he found ten live snails and estimated a population of 1 million snails within the 60-acre colony; at the latter locality he found six live individuals and estimated the population to contain between 1 million to 10 million snails. Additional surveys are needed to more accurately evaluate remaining colonies of this species.

Statement of habitat needs and threats for the species. Like other mountainsnails, this species tends to occur in association with limestone outcrops or soils with high calcium concentration (see, e.g., Henderson and Daniels 1917). Common vegetative cover for this species includes balsam root (*Balsamorhiza* sp.), bitterbrush (*Purshia tridentata*), mountain maple (*Acer* sp.), sagebrush (*Artemisia tridentata*), and wild cherry (*Prunus* sp.; Henderson and Daniels 1916, 1917).

As early as 1915, Henderson and Daniels (1916, 1917) noted habitat degradation from deforestation, fire, or overgrazing at several of their localities. Declining habitat since those early surveys may have taken a toll in the intervening years because Clarke (1993) apparently did not find the species to be as common at some localities as Henderson and Daniels (1917) did. At least one colony appeared to have been extirpated by fires in years immediately preceding surveys by Henderson and Daniels (1916, 1917). Drought can exacerbate anthropogenic effects, increasing erosion (see Henderson and Daniels 1917), and influence the frequency and intensity of fires. Overgrazing has the potential to reduce or eliminate the forb and grass understory.

Anticipated costs and savings. Protection of the lyrate mountainsnail is of economic value to the state of Utah. A lack of proactive water, mining, and recreation management may lead to reduced populations of this species. If lyrate mountainsnail numbers were to be further reduced due to additional habitat degradation, government-imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the lyrate mountainsnail renders this species susceptible to habitat loss and degradation in an area experiencing increasing development and deforestation, and so is designated as a Species of Concern.

8.4 *Oreohelix parawanensis*, Brian Head mountainsnail

Species status statement. This species occurs only at a single locality in Iron County (Gregg 1941), and only recently has this species been demonstrated to be extant (Oliver and Bosworth 2002). Gregg (1941) collected 31 empty shells, and Clarke (1993) and Clarke and Hovingh (1994) found 1 empty shell. Oliver and Bosworth (2002) found 18 live snails and 49 empty shells. The number of individuals in the population has not been estimated, but the area occupied is notably small; all colonies occur in an 11-ha (27.5-acre) area, and only 2.3 ha (5.75 acres) or less of the habitat within this area was occupied (Oliver and Bosworth 2002).

Statement of habitat needs and threats for the species. This terrestrial mollusk occurs at high elevations near the tree line and is associated with vegetation comprising dense clumps of shrubs and forbs (Oliver and Bosworth 2002). The population exists as a patchwork of small colonies distributed in conjunction with limestone and basalt outcrops (Oliver and Bosworth 2002).

Because the population is small and localized, the viability of the population would be compromised by the alteration or destruction of habitat. This site is immediately adjacent to a ski resort and is vulnerable to habitat destruction or alteration through expansion of the resort and associated recreational activities (Clarke and Hovingh 1994, Oliver and Bosworth 2002). Overgrazing has also been identified as a potential concern because livestock could alter the composition and structure of the plant community at this site, and intensive grazing was observed in proximity to this population (Oliver and Bosworth 2002).

Anticipated costs and savings. Protection of the Brian Head mountainsnail is of economic value to the state of Utah. A lack of proactive water and recreation management may lead to reduced populations of this species. If Brian Head mountainsnail numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the Brian Head mountainsnail renders this species susceptible to habitat loss and degradation in an area experiencing increased recreational and agricultural development, and so is designated as a Species of Concern.

8.5 *Oreohelix peripherica,* Deseret mountainsnail

Species status statement. Approximately 13 colonies of this mountainsnail have been found in Utah. Most localities have not been revisited since their discovery during the early 1900s (Henderson and Daniels 1916, 1917). Populations have been reported to occur in portions of Box Elder, Cache, and Weber counties (Henderson and Daniels 1916, 1917; Chamberlin and Jones 1929). Three colonies have been described as distinct subspecies (i.e., *O. p. wasatchensis, O. p. weberiana*, and *O. p. newcombi*), and one of these, the Ogden Rocky mountainsnail (*O. p. wasatchensis*), is currently a candidate for federal listing. Clarke and Hovingh (1994) estimated one colony (subspecies *weberiana*) to contain 20,000 individuals. Another colony (subspecies *wasatchensis*) was said to comprise between 10,000 and 100,000 individuals (Clarke 1993).

Statement of habitat needs and threats for the species. Like other mountainsnails, this species tends to occur in association with limestone outcrops or other soils with high calcium concentration and is typically found in shrubland or montane habitats dominated by small

deciduous trees where an understory of forbs and other protective cover is present (see, e.g., Henderson and Daniels 1916, 1917, Clarke 1993). Colonies tend to be localized in small patches of appropriate habitat.

Because colonies are typically small and localized, habitat alteration or loss is an important conservational concern because reduced habitat suitability would affect population viability. As is the situation for the Ogden Rocky mountainsnail (*O. p. wasatchensis*) which is located near a housing development, several colonies are found in proximity to towns and cities (see, e.g., Clarke 1993) and so are also vulnerable to habitat loss from development. The subspecies *O. p. weberiana* occurs in a single locality immediately adjacent to a major interstate highway, and this population could be affected by alteration of the roadway. Other populations, being located in forest and rangeland habitats, are vulnerable to habitat deterioration from fires and livestock overgrazing.

Anticipated costs and savings. Protection of the Deseret mountainsnail is of economic value to the state of Utah. A lack of proactive transportation, forest, water, mining, and recreation management may lead to reduced populations of this species. If Deseret mountainsnail numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the Deseret mountainsnail renders this species susceptible to habitat loss and degradation in an area that may be impacted by human transportation projects, timber harvest, and agriculture, and so is designated as a Species of Concern.

8.6 *Oreohelix yavapai,* Yavapai mountainsnail

Species status statement. In Utah this species is known to occur at just two localities, Navajo Mountain and the Abajo Mountains, both in San Juan County. Ferriss (1920) found this species to be abundant within the limited area of its occurrence in the Abajo Mountains, but neither this population nor the Navajo Mountain population, for which Ferriss (1920) provided no indication of population size, have been relocated since their initial discovery (Clarke and Hovingh 1994). The species is often difficult to detect, and more attempts to locate populations are needed to determine its status.

Statement of habitat needs and threats for the species. Little is known of the biology and habitat associations of this snail in Utah. However, in the Abajo Mountains, Ferriss (1920) found it in association with aspens and in rocky habitat, specifically noting an association with shale. Clarke and Hovingh (1994) described heavy human disturbance and alterations to the environment on and around Navajo Mountain. Whether overgrazing and human activities have resulted in the extirpation of this population is not known, but it needs additional investigation.

Anticipated costs and savings. Protection of the Yavapai mountainsnail is of economic value to the state of Utah. A lack of proactive forest, water, mining, and recreation management, may lead to reduced populations of this species. If Yavapai mountainsnail numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the Yavapai mountainsnail renders this species susceptible to habitat loss and degradation in an area where additional development may occur, and so is designated as a Species of Concern.

8.7 *Physa megalochlamys,* cloaked physa

Species status statement. The cloaked physa has a highly disjunct, relictual pattern of distribution and is known from 16 locations in interior western North America, from southern Saskatchewan to southern Colorado and west to eastern Oregon (Taylor 1988). Some of the 16 localities are clustered. Globally, there are about seven or eight widely scattered areas of occurrence. In Utah this species occurs at one location in Snake Valley in northwestern Millard County (Taylor 1988).

Statement of habitat needs and threats for the species. This aquatic snail occurs in marshland habitats and ponds throughout its range (Taylor 1988). The single Utah population is in a small, isolated wetland in an arid part of the state where human demands on water resources are great. Because the population is small and localized, the degradation of aquatic habitat through: 1) water withdrawal for agricultural purposes, 2) trampling by livestock, and 3) disturbances and contamination from adjacent development has the potential to jeopardize population viability or result in catastrophic loss of the population.

Anticipated costs and savings. Protection of the cloaked physa is of economic value to the state of Utah. A lack of proactive agricultural, petroleum, water, mining, and recreation management may lead to reduced populations of this species. If cloaked physa numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the cloaked physa makes it susceptible to habitat loss and degradation in an area experiencing increasing development, and so is designated as a Species of Concern.

8.8 *Physella utahensis,* Utah physa

Species status statement. The current distribution of this freshwater snail comprises four populations in Utah and two populations in Colorado. The distribution formerly consisted of twelve or fewer populations, the species occurring at perhaps as many as seven locations in Utah, three in Colorado, and two in Wyoming. The present-day distribution of these populations is a highly disjunct, relictual pattern.

The Utah physa was extirpated from Utah Lake by the early 1930s. Although Clarke (1991) reported large populations of this species at the four sites in Utah where the species still exists, the loss of the population in Utah Lake is evidence that even large populations are vulnerable to pervasive habitat degradation within the occupied area.

Statement of habitat needs and threats for the species. Populations occur in small pools associated with springs (Clarke 1991). The substrates of the pools are variable, ranging from fine silt to rocks (see, e.g., Clarke 1991). The degree of vegetation, too, is variable, including areas with no vegetation and areas with exceptionally dense patches of plants, such as watercress.

Threats include introduced fish populations, degradation of habitat and water quality by livestock use, and dewatering of the inhabited aquatic sites. More importantly, some (perhaps all) of these sites are threatened by demonstrated chemical contamination from local industrial activities. Additional research is needed to determine the mechanisms of physiologic threat posed by various chemicals.

Anticipated costs and savings. Protection of the Utah physa is of economic value to the state of Utah. A lack of proactive wildlife, petroleum, industrial water, mining, oil/gas industry, and recreation management may lead to reduced populations of this species. If Utah physa numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the Utah physa makes it susceptible to habitat loss and degradation in an area with demonstrated water contamination, and so is designated as a Species of Concern.

8.9 *Physella zionis*, wet-rock physa

Species status statement. This freshwater snail is endemic to two connected canyons, Zion Canyon and Orderville Canyon, along the North Fork of the Virgin River in Zion National Park, in Washington County. This is a linear stretch of about 5 kilometers (3.1 miles). Ng and Barnes (1986) commented that this species "has probably never existed in large numbers, and, in comparison to other snails, it may be considered rare."

Statement of habitat needs and threats for the species. The wet-rock physa inhabits seeps and hanging gardens of vegetation mainly on the vertical sandstone walls of narrow canyons through which the North Fork of the Virgin River flows (Pilsbry 1926, Ng and Barnes 1986). Where wetted by springs or seeps, these canyon walls may be covered with algae (Pilsbry 1926). The hanging gardens are composed of such plants as maidenhair ferns, cardinal flowers, and columbines (Whipple 1987).

Clarke (1991) pointed out some potential threats that would jeopardize the existence of this species. Those threats include dewatering of the area east of the Virgin River and south of Orderville Canyon or other activities which might be planned to accommodate increasing numbers of visitors to Zion National Park.

Anticipated costs and savings. Protection of the wet-rock physa is of economic value to the state of Utah. A lack of proactive water and recreation management may lead to reduced populations of this species. If wet-rock physa numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could result.

Rationale for proposed designation. The limited distribution of the wet-rock physa makes it susceptible to habitat loss and degradation in an area experiencing increasing development and human population growth, and so is designated as a Species of Concern.

8.10 *Pyrgulopsis anguina,* longitudinal gland pyrg

Species status statement. This freshwater snail is endemic to an area on the Utah–Nevada border, Snake Valley, where it is known to occur in only two springs (Hershler 1994b, 1998). The one spring in Utah in which it occurs is in northwestern Millard County. Hershler (1994b) reported this species to be common within the limited area in which it occurs.

Statement of habitat needs and threats for the species. Hershler (1994b) described the habitat of this species as two warm, flowing springs at 16°C (61°F) and 17°C (63°F), respectively, both with intermediate conductivity.

Because it is localized in a single small spring, the Utah population is vulnerable to habitat loss. Long-term maintenance of suitable aquatic conditions at this spring is essential to the continued survival of the species in this state. However, Hershler (1994b) reported a high level of disturbance of this spring from livestock and water diversion. The spring now issues from an artificial structure, a box, and its flow is mostly diverted to an irrigation ditch. Boxing and diversion of the spring artificially limit usable habitat for this species, reducing available water and suitable substrate habitat. Trampling of snails by livestock and degradation of critically important water quality through livestock use are threats to population viability of this species.

Anticipated costs and savings. Protection of the longitudinal gland pyrg is of economic value to the state of Utah. A lack of proactive agricultural and water management may lead to reduced populations of this species. If longitudinal gland pyrg numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the longitudinal gland pyrg makes it susceptible to habitat loss and degradation in an area experiencing increased agricultural development, and so is designated as a Species of Concern.

8.11 *Pyrgulopsis chamberlini,* smooth Glenwood pyrg

Species status statement. This Utah endemic freshwater snail occurs only in two closely associated springs in Sevier County, Utah (Hershler 1994b, 1998). Hershler (1994b) reported this species to be abundant at the type locality. However, because this species occurs in two closely associated springs, and nowhere else in the world, its overall abundance must be considered very low.

Statement of habitat needs and threats for the species. The smooth Glenwood pyrg is restricted to the aquatic habitats produced by the two associated springs (Hershler 1994b, 1998). Hershler (1994b) reported the temperature to be 16°C (61°F) with intermediate conductivity in one of the springs, which was described as flowing.

Hershler (1994b) considered the springs inhabited by this species to be highly disturbed, and Hershler (1998) noted that one of the springs "was highly impacted by recreational activities." The extremely limited distribution of the smooth Glenwood pyrg, coupled with known alterations to its only habitats, constitutes a threat to the continued viability of this species.

Anticipated costs and savings. Protection of the smooth Glenwood pyrg is of economic value to the state of Utah. A lack of proactive water, agricultural, and recreation management may lead to reduced populations of this species. If smooth Glenwood pyrg numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the smooth Glenwood pyrg makes it susceptible to habitat loss and degradation in an area experiencing heavy recreational use and possible additional development in the near future, and so is designated as a Species of Concern.

8.12 *Pyrgulopsis deserta,* desert springsnail

Species status statement. This species inhabits ten springs in the Virgin River drainage, comprising seven springs in Washington County, Utah, and three springs in adjacent Mohave County, Arizona (Hershler and Landye 1988, Hershler 1994a). These springs are small and

isolated (Pilsbry 1916, Hershler 1994a). Specimens were last collected at the seven inhabited springs in Utah in 1973 and 1977 (Hershler and Landye 1988).

Statement of habitat needs and threats for the species. The desert springsnail is a spring obligate, but no details of its habitat, such as water characteristics, have been reported. As recognized by Pilsbry (1916) almost a century ago, the small and localized populations are vulnerable to extirpation from habitat loss or stochastic environmental events. Flow diversions, enclosures, and other alterations of the springs, and the disturbance and degradation of the springs by livestock trampling and by human recreation are threats to population viability. The rapid urban expansion of St. George and agricultural development in Washington County are threats to the habitat of this springsnail, as are the increasing human demands for water in these areas.

Anticipated costs and savings. Protection of the desert springsnail is of economic value to the state of Utah. A lack of proactive water, development, agricultural, and recreation management may lead to reduced populations of this species. If desert springsnail numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the desert springsnail makes it susceptible to habitat loss and degradation in an area experiencing increasing development and heavy agricultural water withdrawals, and so is designated as a Species of Concern.

8.13 *Pyrgulopsis fusca,* Otter Creek pyrg

Species status statement. This freshwater snail, which is endemic to Utah, occurs only in three locations in south-central Utah: one in Piute County and two in Sevier County. Hershler (1994b) reported this species to be common within the limited occupied area at two of the three localities; the relative abundance of the third population is unknown. It is not known from anywhere else in the world.

Statement of habitat needs and threats for the species. The Otter Creek pyrg is restricted to the aquatic habitats produced by the outflow of springs (Hershler 1998). Hershler (1994b) reported that all three of the localities are flowing springs with elevations ranging from 2048 to

2210 m (6,720 to 7,250 ft), temperatures ranging from 7 to 13°C (45 to 55°F), and with low conductivities.

Because the species is confined to specialized habitats that are geographically localized, populations are vulnerable to habitat degradation and loss. Hershler (1994b) reported all three sites known to support this species to be slightly disturbed, two of them by livestock. Hershler (1994b) also noted that one of the sites is near a road. The limited habitat and restricted distribution of this springsnail, combined with known habitat disturbances, constitute a threat to the continued viability of this species.

Anticipated costs and savings. Protection of the Otter Creek pyrg is of economic value to the state of Utah. A lack of proactive water, mining, forest, transportation, and recreation management may lead to reduced populations of this species. If Otter Creek pyrg numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the Otter Creek pyrg makes it susceptible to habitat loss and degradation in an area susceptible to agricultural and timber harvest disturbances, and so is designated as a Species of Concern.

8.14 *Pyrgulopsis hamlinensis,* Hamlin Valley pyrg

Species status statement. This Utah endemic, freshwater snail occurs only in one small spring complex in western Beaver County. Hershler (1994b) considered this species to be abundant within the limited extent of the occupied area.

Statement of habitat needs and threats for the species. The Hamlin Valley pyrg is restricted to the aquatic habitats produced by the outflow of a small spring complex. Hershler (1998) described the only known locality for this species as “a small, high elevation flowing spring.” Hershler (1994b) reported the elevation of the locality to be 2180 m (7,160 ft), the temperature of the spring to be 16°C (61°F), with relatively low conductivity, and possessing a rocky substrate.

Hershler (1994b, 1998) considered the site inhabited by this species to be slightly disturbed and slightly impacted by cattle. The extremely limited global distribution of the

Hamlin Valley pyrg and the reported impacts to its only known locality represent a threat to the continued existence of this species.

Anticipated costs and savings. Protection of the Hamlin Valley pyrg is of economic value to the state of Utah. A lack of proactive water, agricultural, petroleum exploration, and recreation management may lead to reduced populations of this species. If Hamblin Valley pyrg numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The singular distribution of the Hamblin Valley pyrg renders this species especially susceptible to any habitat loss or degradation from recreation or water contamination, and so is designated as a Species of Concern.

8.15 *Pyrgulopsis inopinata,* carinate Glenwood pyrg

Species status statement. This freshwater snail, which is endemic to Utah, is known to occur in three springs at two localities in Sevier County. Hershler (1994b) considered this species to be scarce at one of the localities. At the other, Hershler (1998) hypothesized that this species is hybridizing with another species, *Pyrgulopsis kolobensis.*

Statement of habitat needs and threats for the species. The carinate Glenwood pyrg is restricted to the aquatic habitats produced by springs. Hershler (1994b) reported the habitat of this species at one of the localities to be a flowing spring with a temperature of 16°C (61°F), with moderate conductivity and at an elevation of 5,580 ft.

Hershler (1994b) noted high disturbance and recreational use at one locality. The possibility that this species is hybridizing with the *Pyrgulopsis kolobensis* (Hershler 1998) at the other locality constitutes a threat to the carinate Glenwood pyrg. The limited distribution and low abundance of this springsnail, coupled with the impacts of habitat disturbance and possible hybridization, constitute a threat to the continued existence of this species.

Anticipated costs and savings. Protection of the carinate Glenwood pyrg is of economic value to the state of Utah. A lack of proactive water, forestry, petroleum, and recreation management may lead to reduced populations of this species. If carinate Glenwood pyrg numbers were to be further reduced due to additional habitat degradation, or if disturbances by

humans increased hybridization rates, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the carinate Glenwood pyrg makes it susceptible to habitat loss and degradation in an area susceptible to increased resource development, and so is designated as a Species of Concern.

8.16 *Pyrgulopsis nonaria,* Ninemile pyrg

Species status statement. This Utah endemic occurs only in two springs, not far apart, near Ninemile Reservoir in Sanpete County. Hershler (1994b) reported this species to be abundant in one of the two small springs.

Statement of habitat needs and threats for the species. The Ninemile pyrg is restricted to the aquatic habitats produced by two springs in Sanpete County, Utah. Hershler (1994b) reported one of these springs to have a temperature of 12°C (54°F) and an elevation of 1690 m (5,540 ft). This spring was described as a "shallow, broad, mineralized, high-conductivity, flowing spring" (Hershler 1998).

Hershler (1994b) noted slight disturbance at one of the two inhabited springs. The extremely limited distribution of this species and its dependence upon disturbed habitat constitute a threat to continued population viability.

Anticipated costs and savings. Protection of the Ninemile pyrg is of economic value to the state of Utah. A lack of proactive water management may lead to reduced populations of this species. If Ninemile pyrg numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the Ninemile pyrg makes it susceptible to habitat loss and degradation in an area susceptible to increased development, and so is designated as a Species of Concern.

8.17 *Pyrgulopsis peculiaris,* bifid duct pyrg

Species status statement. This freshwater snail is endemic to six springs in Millard County, Utah, and two springs in adjacent White Pine County, Nevada (Hershler 1994b, 1998).

At two of the Utah localities, it was reported to be scarce, and at three other Utah localities it was considered to be common (Hershler 1994b).

Statement of habitat needs and threats for the species. The bifid duct pyrg is a spring obligate. Seven of the inhabited sites were described as flowing springs. Water temperatures of these seven springs ranged 9-13°C (48-55°F). Conductivities reported for five of the springs ranged from moderate to high (Hershler 1994b).

Only one of the Utah springs inhabited by this species was considered by Hershler (1994b) to be undisturbed. At three of the springs, disturbance was slight, and at another, spring disturbance was moderate (Hershler 1994b). Diversion of the flow of one spring was noted, livestock were present at another, and recreational use was evident at three springs. The very limited distribution of this species, together with documented disturbances of occupied sites—trampling and degradation of water quality and aquatic substrates by livestock, water diversion, and recreational activities—threaten the continued existence of this species in Utah.

Anticipated costs and savings. Protection of the bifid duct pyrg is of economic value to the state of Utah. A lack of proactive water, agricultural, petroleum, and recreation management may lead to reduced populations of this species. If bifid duct pyrg numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the bifid duct pyrg makes it susceptible to habitat loss and degradation in an area experiencing continuing impacts to the aquatic habitat, and so is designated as a Species of Concern.

8.18 *Pyrgulopsis pilsbryana,* Bear Lake springsnail

Species status statement. This species is restricted to the Bear Lake basin of extreme southeastern Idaho, extreme north-central Utah, and extreme southwestern Wyoming. It is known to be at 12 localities in springs and associated waters (e.g., spring outflows and spring-fed ponds). It occurs at eight localities in Bear Lake, Caribou, and Franklin counties, Idaho; in three springs in Rich County, Utah; and in one spring complex in Lincoln County, Wyoming (Hershler 1998). Hershler (1994b) reported that this species is common within the limited occupied habitat in all three of the springs in Utah.

Statement of habitat needs and threats for the species. The Bear Lake springsnail inhabits springs and associated waters (e.g., spring outflows, streams, and spring-fed ponds); however, all three Utah populations are in springs (Hershler 1994b, 1998). Characteristics of the water bodies inhabited by this species include: temperatures of 9–15°C (48-59°F) and moderate to high conductivities (Hershler 1994b). Seven of the twelve occurrences of this species (including the three in Utah) are in flowing springs, two are in spring pools, one is in a seep from a pond, and one is in a stream (Hershler 1994b).

Hershler (1994b) noted that all three of the inhabited Utah springs were disturbed, the disturbance being high in one case and moderate in the other two. These disturbances were the result of trampling by livestock at one spring, diversion of water at another, and proximity of a road at the third. Documented habitat disturbances and the limited distribution of this species in Utah constitute a threat to the continued existence of the species in the state.

Anticipated costs and savings. Protection of the Bear Lake springsnail is of economic value to the state of Utah. A lack of proactive water, agricultural, transportation, and recreation management may lead to reduced populations of this species. If Bear Lake springsnail numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could result.

Rationale for proposed designation. The limited distribution of the Bear Lake springsnail makes it susceptible to habitat loss and degradation in an area experiencing disturbances and development, and so is designated as a Species of Concern.

8.19 *Pyrgulopsis plicata,* Black Canyon pyrg

Species status statement. This freshwater snail occurs only in a single complex of springs in Black Canyon in Garfield County (Hershler 1994b, 1998). Hershler (1994b) reported this species to be common within the limited extent of its occurrence.

Statement of habitat needs and threats for the species. The Black Canyon pyrg occurs in a “series of small flowing springs emerging from a steep hillside” (Hershler 1998), with water temperature of 16°C (61°F) and moderate conductivity.

The spring complex inhabited by this species feeds a small reservoir (Hershler 1994b, 1998), and Hershler (1994b) observed a slight disturbance there. Because this species is endemic

to one spring complex, the population is vulnerable to extinction as a result of habitat loss; even a slight disturbance would be a threat to the continued survival of this species.

Anticipated costs and savings. Protection of the Black Canyon pyrg is of economic value to the state of Utah. A lack of proactive water, mining, agricultural, and recreation management may lead to reduced populations of this species. If Black Canyon pyrg numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the Black Canyon pyrg makes it susceptible to habitat loss and degradation in an area susceptible to development, and so is designated as a Species of Concern.

8.20 *Pyrgulopsis saxatilis,* sub-globose Snake pyrg

Species status statement. This freshwater snail is endemic to one locality, a spring complex in Millard County. Hershler (1994b) reported the sub-globose Snake pyrg to be common at this locality. Because of its extremely limited distribution, however, the overall abundance of this species is low.

Statement of habitat needs and threats for the species. The sub-globose Snake pyrg is restricted to aquatic habitats produced by thermal springs in a single spring complex. Hershler (1998) described the spring complex as a series warm flowing springs issuing from the side of a hill. Hershler (1994b) reported the springs to have a temperature of 27°C (81°F), with a moderate conductivity, and an elevation of 1500 m (5,080 ft).

Hershler (1994b) reported slight disturbance of the spring complex inhabited by this species and noted recreational use of the site. The extremely limited distribution of the sub-globose Snake pyrg, coupled with recreational use of its only known habitat, constitutes a threat to the continued existence of the species.

Anticipated costs and savings. Protection of the sub-globose Snake pyrg is of economic value to the state of Utah. A lack of proactive water, agricultural, petroleum, and recreation management may lead to reduced populations of this species. If sub-globose Snake pyrg numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the sub-globose Snake pyrg makes it susceptible to habitat loss and degradation in an area susceptible development, and so is designated as a Species of Concern.

8.21 *Pyrgulopsis transversa,* southern Bonneville pyrg

Species status statement. This Utah endemic freshwater snail is known to occur in six springs in central Utah. Four of these localities are in Tooele County, and there is one locality each in Utah and Sanpete counties (Hershler 1998). Hershler (1994b) reported this species to be common at two of the six known localities and abundant at two other localities.

Statement of habitat needs and threats for the species. This species is restricted to the aquatic habitats produced by springs. Hershler (1994b) reported habitat information for five of the six known localities of this species. Four of the springs are reported to be flowing, and one forms a marsh. The temperatures of these springs range from 12 to 16°C (54 to 61°F), with moderate to high conductivities, and the elevations of which range from 1780 to 2050 m (5,830 to 6,740 ft).

Hershler (1994b) provided information on threats to five of the springs inhabited by this species. Four of the sites are considered moderately disturbed, and one is considered highly disturbed. Livestock were present at three of the sites; at least one of the springs has been manually excavated, and there is development near one of the springs. The limited distribution and restricted habitat of the southern Bonneville pyrg, combined with documented habitat disturbance, constitute threats continued population viability.

Anticipated costs and savings. Protection of the southern Bonneville pyrg is of economic value to the state of Utah. A lack of proactive water, agricultural, petroleum, and recreation management may lead to reduced populations of this species. If southern Bonneville pyrg numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The limited distribution of the southern Bonneville pyrg makes it susceptible to habitat loss and degradation in an area that has been disturbed and developed, and so is designated as a Species of Concern.

8.22 *Pyrgulopsis variegata,* northwest Bonneville pyrg

Species status statement. In Utah, this freshwater snail has been reported to occur in eight springs in far western Box Elder County and one spring in extreme northwestern Tooele County (Hershler 1998). Recently, however, one of the populations in Box Elder County was lost to alteration of the spring habitat. This species also occurs in Elko County, Nevada. In most of the springs inhabited by this snail in Utah, the species has been reported to be common, though in one spring it was scarce and in another it was abundant (Hershler 1994b).

Statement of habitat needs and threats for the species. This species is restricted to the aquatic habitats produced by springs. Hershler (1994b) reported that eight of the springs inhabited by this snail in Utah are rheocrenes (flowing springs) and the other forms a wetland. He also reported that the temperatures of these springs ranged from 13 to 19 °C (55 to 66°F), with moderate to high conductivities, the elevations of which ranged from 1290 to 2025 m (4,235 to 6,640 ft).

Hershler (1994b) noted that several of the springs inhabited by this snail were moderately disturbed. Since the description of this species in 1998, one population was lost when the spring was developed for agricultural purposes. Further habitat degradation from livestock, water diversion, or other sources could threaten additional populations of this species. The restricted distribution and limited habitat of this springsnail, combined with known habitat degradation and the recent loss of a population, constitute threats to the continued viability of the species.

Anticipated costs and savings. Protection of the northwest Bonneville pyrg is of economic value to the state of Utah. A lack of proactive water, agricultural, and recreation management may lead to reduced populations of this species. If northwest Bonneville pyrg numbers were to be further reduced due to additional habitat degradation, government imposed recreation and development restrictions could be the result.

Rationale for proposed designation. The demonstrated recent losses of individuals and the limited distribution of the northwest Bonneville pyrg illustrates how susceptible to habitat loss and degradation in an area experiencing increasing development, and so is designated as a Species of Concern.

8.23 *Anodonta californiensis,* California floater

Species status statement. Seven extant populations of this freshwater mussel are known in Utah, all within the Bonneville Basin. Population losses are evident, but the magnitude of the decline is difficult to interpret. Several species of *Anodonta* have been reported in Utah historically, but the identification of populations thought to be *Anodonta* species other than *A. californiensis* cannot be confirmed because they have been extirpated. Considering only those populations identified as *A. californiensis,* at least six populations have been extirpated (see Henderson 1936, Clarke 1993, Mock and Brim-Box 2003). However, all reported populations of *Anodonta* in Utah potentially represent one morphologically variable species (see e.g., Clarke 1993, Mock and Brim-Box 2003). The inclusion of these additional extirpated populations (e.g., those in Henderson 1924, Chamberlin and Jones 1929, Jones 1940) would suggest a decline even more dramatic than a strict interpretation of the historical distribution of the California floater would indicate.

Several of the extant populations appear to be at high risk of extirpation. Mock and Brim-Box (2003) found just one live individual and two empty shells at one locality, which would indicate that this population is very small. Two populations are probably not viable because genetic diversity within the population is critically low (Mock and Brim-Box 2003). The catastrophic loss of larger populations is probable as well. The population formerly occurring in Utah Lake was likely to be among the largest in Utah, yet it was the first population reported to have been extirpated. Similarly, Mock and Brim-Box (2003) found thousands of empty shells but no live individuals in one reservoir, suggesting the recent and catastrophic extirpation of a population that was once large.

Statement of habitat needs and threats for the species. This freshwater mussel occurs in lake and pond habitats, including several reservoirs, and low-gradient streams at middle elevations in Utah. Extant populations are localized and are vulnerable to habitat loss or degradation. Water withdrawal is of importance to all populations, but particularly to the several populations occurring in reservoirs (see Clarke 1993). Water pollution from agricultural run-off is of concern and may be the cause of the extirpation of some populations (Clarke 1993).

Larval floaters (i.e., glochidia) are obligate parasites of fish, and so require appropriate hosts to complete their life cycles. It is not known whether they can parasitize nonnative fish

species. Introduced fish species, habitat degradation, and other factors affecting host-fish populations would ultimately be a threat to populations of California floaters (Clarke 1993, Mock and Brim-Box 2003).

Reproductive depression arising from inbreeding is an immediate threat to two populations because critically low genetic diversity is evident in these populations. Hybridization is a threat as well; Mock and Brim-Box (2003) detected evidence of genetic introgression in one population. Limited genetic divergence among Utah populations of this mussel decreases the species' ability to adapt to environmental changes.

Anticipated costs and savings. Stable habitats are required for the long-term population viability of this species. Control of nonnative fish species may be required. Cooperative, proactive measures to stabilize habitats where the California floater occurs can help secure populations and decrease the need for governmental-imposed restrictions on development and agriculture. Locating, documenting, and protecting populations is needed to decrease the likelihood that local communities will be negatively impacted by development restrictions in the future.

Rationale for proposed designation. The California floater is dependent on limited water sources, often in remote locations, and so is vulnerable to habitat alteration and loss. Its limited genetic diversity increases its vulnerability to future environmental changes. A large fraction of the North American mussel fauna has been lost in the last 200 years, suggesting that this species could also be lost. Utah designates this unique animal a Species of Concern to highlight the need to protect California floater from additional habitat and population losses.

8.24 *Margaritifera falcata,* western pearlshell

Species status statement. Formerly about nine populations of this freshwater mussel were known in Utah, all in the northern third of the state (Call 1884, Henderson 1924, Chamberlin and Jones 1929, Woolstenhulme 1942a, 1942b). Clarke (1993) expressed the opinion that all populations in Utah have been extirpated, but there is the possibility that small populations yet persist; evidence is not yet sufficient to assume that all populations have been extirpated because individuals of this species can be quite long-lived. Populations could exist at low levels for many years.

The size and extent of historical populations were not reported. No populations have been found at historical localities in recent times (Clarke 1993).

Statement of habitat needs and threats for the species. This freshwater mussel has been found in streams, primarily in areas with fast-moving waters. Larval pearlshells (i.e., glochidia) are parasites of fish and require the presence of an appropriate host species for successful reproduction. Changes in fish abundance, diversity, and species composition may have historically affected reproductive success and may continue to do so in extant populations. Because this is an aquatic organism occupying high-quality aquatic habitat, water withdrawals, changes to flow regimes and patterns of sediment deposition, and degradation of aquatic habitat would be threats to populations. Therefore, dams could affect population viability.

Anticipated costs and savings. The western pearlshell requires high quality water. If proactive efforts can be implemented to protect such water sources and intermediate fish host species, the potential for restrictions to local communities, developers, and agriculture can be reduced. If habitats are degraded without regard for this species, state and/or federal government restrictions could be imposed.

Rationale for proposed designation. Previous actions by humans have reduced this species dramatically, to the point that it may no longer persist in the state. If live specimens are located, they will be of great value to Utah's biodiversity. Because it is a unique species that is vulnerable to reduced habitat quantity and quality and host population changes, it is considered a Species of Concern.

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